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PART I.

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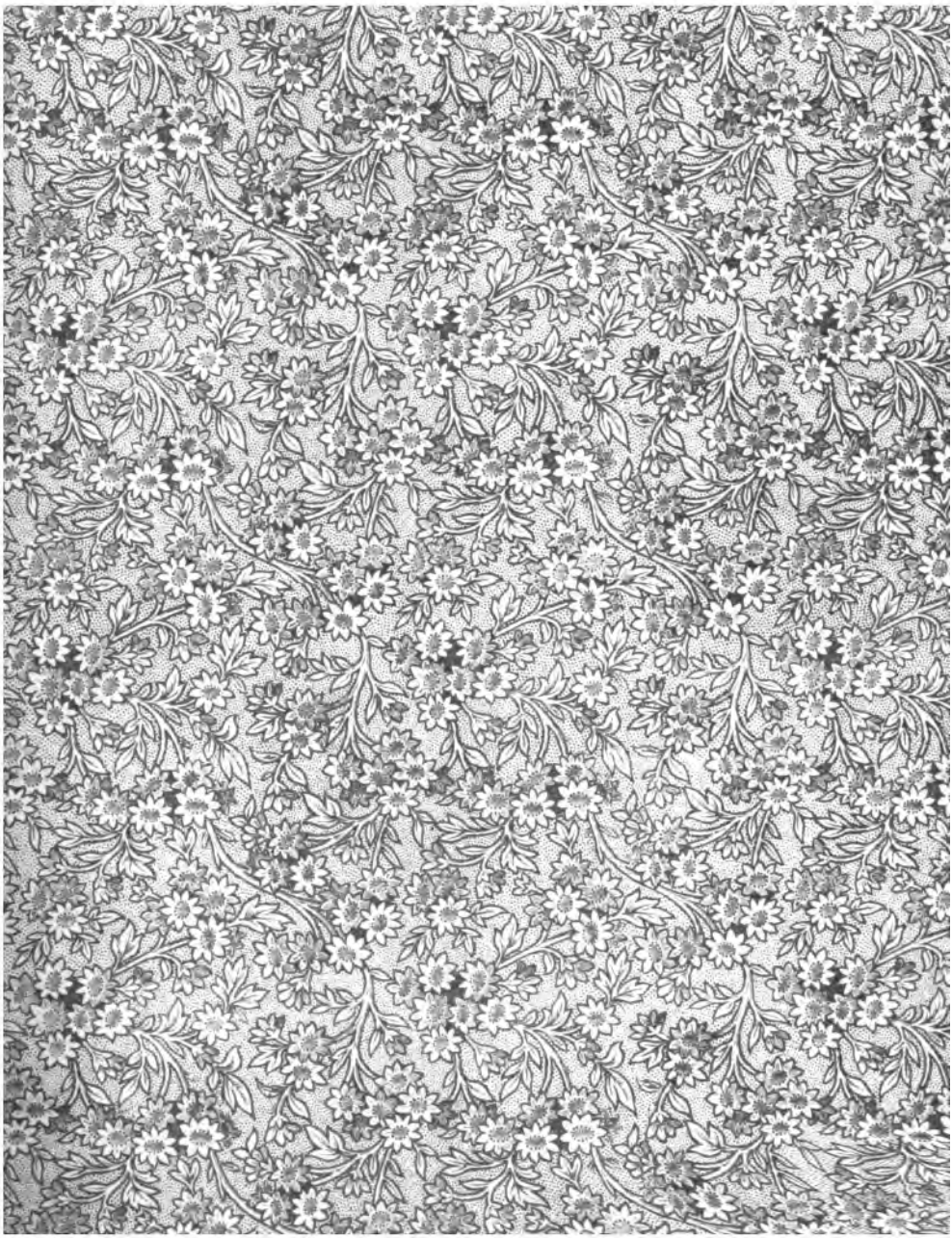

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THE

MODERN TREATMENT OF DISEASES OF THE HEART ...

A MANUAL OF CLINICAL THERAPEUTICS.

BY

PROF. DUJARDIN-BEAUMETZ,

Member of the Academy of Medicine, and of the Council of Hygiene and Salubrity of the Seine; Editor-in-Chief of the Bulletin Général de Thérapeutique, &c., &c.

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TRANSLATED FROM THE FOURTH FRENCH EDITION

BY

E. P. HURD, M. D.,

President of the Essex North District Medical Society, Member of the Massachusetts Medical Society, and of the Climatological Society; One of the Physicians to the Anna Jaques Hospital, Newburyport, Mass.

1887.
GEORGE S. DAVIS,
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AUTHOR'S PREFACE.

My friend, Dr. Hurd, to whom I am indebted for the translation of so many of my writings, informs me that he is about to give to medical readers of the United States, from the press of George S. Davis, a reproduction of such part of the first volume of my *Leçons de Clinique Thérapeutique* as pertains to the Treatment of Diseases of the Heart and Aorta. When this book shall have been published, the whole of the first and third volumes of the work aforesaid will have appeared in an English dress; "Diseases of the Heart and Aorta" constituting, with "Diseases of the Stomach and Intestines," published last year by Wm. Wood & Co., the first volume, and the third volume being the work issued by Mr. G. S. Davis in 1885, and entitled "Clinical Therapeutics."

When the frequency of cardiac affections and the difficulties attending their treatment are considered, the utility of hand books of this kind is apparent. Although the primary lesion, the valvular alteration, is itself incurable, it is in the power of the well-informed practitioner to do much to alleviate and remove the multiple morbid manifestations which result from the disturbance of the circulation, and it may truly be affirmed, that in no class of chronic and essentially incurable diseases are the benefits of rational therapeutics more conspicuous.

I do not claim to have added much that is new to the established treatment of valvular affections, but I have endeavored, concisely and plainly, to lay down rules and give directions which will enable the practitioner to administer the cardiac medicaments with the greatest chance of success and

the least risk. As in my previous writings on therapeutics, I have added to these lectures numerous notes which supplement the text and indicate the state of medical science on the subjects treated, at the time when these chapters were published.

I cannot conclude without thanking the translator for the fidelity, zeal and patience with which he has accomplished his task, and expressing my satisfaction that I am again permitted to address the American medical public on subjects to which I have devoted my life and all my energies.

DUJARDIN-BEAUMETZ.

PARIS, May 1st, 1887.

TRANSLATOR'S PREFACE.

The little volume here presented to medical readers as a part of the "Leisure Library Series," though comprehending the treatment of only a limited department of the heart diseases, namely, the valvular lesions—the results of endocarditis, nevertheless contains the principles of treatment applicable to all the cardiac affections. Scarcely a day passes during which, in the ordinary routine of his labor, the general practitioner does not have an opportunity to put in practice some of the therapeutic rules and methods laid down in this little volume.

The author, in his desire to be practical, has considered only those forms of valvular disease which are of most common occurrence: lesions of the mitral and aortic valves; but, as he properly observes, it is not the lesions themselves which are tributary to therapeutics, but only the consequences of those lesions. That much can be done to mitigate and ameliorate these consequences, he rightly insists.

The diagnosis of these valvular affections is a matter of no little importance, for without a correct appreciation of the kind of lesion and its location, treatment must be hap-hazard and conjectural. In making a diagnosis, the practitioner is largely guided by certain morbid blowing sounds which occur with the first or second sound of the heart; these are called *bruits* or *murmurs*. It is true that these bruits are sometimes absent, and the physician must be guided by other signs, but when present, they are of great diagnostic value.

The following table, which I borrow from the American Journal of Medical Sciences (October, 1880) is likely to prove useful in aiding one to remember the important facts connected with these cardiac murmurs:

The formula, and the order of words to be recalled are:

{ Stenosis—Insufficiency.
{ Insufficiency—Stenosis.

For example:

At the base. { A deranged first sound indicates *stenosis* of the aortic or pulmonary artery valves.
A deranged second sound indicates *insufficiency* of those valves.

At the apex. { A deranged first sound indicates insufficiency of the bicuspid or tricuspid valves.
A deranged second sound indicates stenosis of the same valves.

Since the fourth edition of this work (from which the present translation is made) was published (in 1885), several new heart tonics have been introduced into the materia medica. Adonidine is perhaps one of the best, and will often be of service as an adjuvant to digitalis, or when digitalis cannot be borne. It is the active principle of the *Adonis vernalis*, a ranunculus, from which it was first obtained in 1882 by Vincenzio Cervello. Adonidine is the glucoside of adonis, and is given in the dose of a third of a grain (20 milligrammes). One or two pills of a centigram (1/6 grain) each may be given three times a day; this dose will often have a real tonic effect on the heart, and it may be continued much longer than it is safe to give digitalis. Under the influence of adonidine there is an increase of the arterial tension, the beatings of the heart become regular, the pulse diminishes in frequency, and diuresis is augmented.

Sparteine, a product of the *Spartium scoparium*, is another of the new alkaloids, the introduction of which into therapeutics is due to Laborde and Germain Sée. The dose is two centigrams (1/3 grain) three times a day. It has been highly commended as a prompt and safe cardiac tonic.

The treatment of cardiac and other dropsies by Apocynum Cannabinum (American Indian hemp) was lately the subject of an interesting paper, by Dr. A. H. Smith, before the New York Academy of Medicine. This plant, which is a native of America, has long been prized for its diuretic properties. In atonic cases it has been recommended in small doses, at short intervals. Dr. Jewett, of Rhode Island, who has made much use of this plant in dropsical cases, and is enthusiastic in its praise, advises a decoction to be made with one drachm of the bark of the fresh root to eight ounces of water; of this a tablespoonful may be given every six hours. A favorite method among the eclectics is to put twenty drops of the tincture into half a tumblerful of water; of this a teaspoonful may be given every hour.

Schmieberg has recently isolated from the root of apocynum a substance analogous to digitalis, which he calls *apocynine*.

Still more recently, Jendrassik and Steller have recommended in cardiac dropsies the use of an old remedy, calomel, which in two or three three grain doses, several hours apart, is said to produce abundant and long continuing diuresis, with removal of dropsical swellings, and without the least sign of mercurialization. These beneficial results have been said to follow the use of calomel after digitalis has failed to give relief, or could not be tolerated. The treatment of cardiac and other general dropsies by concentrated saline solutions (℥ vi of sulphate of magnesia in a wineglassful of water, the patient to drink nothing whatever for several hours before and after the dose), has been highly commended by several late authorities, and will sometimes remove effusions when other means fail

Cocaine has recently been found to act, in small doses, as a prompt and powerful stimulant of the heart, and minute doses of atropine have the same action, and have been resorted to with advantage when the indication has been as speedily as possible to whip the flagging heart into activity.

This little volume, and the succeeding volume which pertains to Diseases of the Aorta, will, I trust, be welcomed by the medical profession of the United States as fairly representing the present status of regular medicine, as regards the therapeutics of the diseases of which they treat. The text of the original is profusely supplemented by notes; many of these I have retained in juxtaposition with the text, but the longer ones I have been obliged to insert as appendices to the several chapters the small (duodecimo) size of these volumes necessitating this departure from the arrangement of the original. The reader is recommended to read carefully the notes, as they embody much valuable information, and are the fruit of no little labor.

Only a portion of the bibliographical indications of the French text could be given, as the prescribed size of the volume has already been exceeded. Only those references, therefore, have been retained, which were deemed the most important; these will be found at the close of the chapters. The ordinary reader, who, even if he reads French, cannot have access to the works cited, will not complain of the loss of those bibliographical references which are omitted. It will readily be seen that the author of this work is a man of erudition as well as of originality, who gleans from the whole field of contemporaneous medical literature, and who, while making valuable contributions from the fruit of his own independent investigations, is ever ready to give due credit to others for their useful discoveries.

Concise and cheap compendiums of medicine seem now to be the fashion, and the "Leisure Library Series" is, I am assured, already financially a success. For the information of such as are interested in the writings of the author, I may say that it is quite probable that too small volumes on the treatment of Diseases of the Liver and Kidneys will appear in the Library Series for 1888.

E. P. HURD, M. D.

NEWBURYPORT, MASS., July 1st, 1887.

DISEASES OF THE HEART.

CHAPTER I.

TREATMENT OF COMPENSATED MITRAL AFFECTIONS

SUMMARY.—The Diseases of the Heart—Divisions—Mitral Diseases — Sequence of Symptoms in Mitral Affections—Compensatory Hypertrophy—History of the Therapeutics of Diseases of the Heart—Compensated Mitral Lesions—Hygienic Treatment—Exercise—Diet—Alcohol and Tobacco—Influence of Climate and of Compressed Air—Moral Hygiene—Hydrotherapy—Influence of Pregnancy, of Traumatism—Medicines—Dangers of Digitalis—Bromide of Potassium.

GENTLEMEN: In beginning our course with the study of diseases of the heart, we shall find this subject admirably adapted to illustrate the utility of clinical therapeutics according to my method of teaching. In fact we are generally in presence of a chronic disease, incurable in its nature, and recognized as such; nevertheless despite the gloomy prognosis, I shall show you, by abundant instances, that the physician, far from being powerless to give relief, may, by availing himself of well directed therapeutic agencies, have a favorable and dominating influence on the march of these affections.

But before studying the divers means which we possess of relieving cardiac patients and ameliorating their condition, some preliminary considerations seem necessary concerning the evolution of diseases of the heart.

These affections, as you are aware, are divided into two great groups :

1. Those which are acute and accompanied with fever.

2. Those which, on the contrary, have a slow and progressive march.

In the present course of lectures we shall consider more especially the latter ; these constitute, properly speaking, the classical heart diseases, which you will most frequently observe, and which will demand from you the most intelligent treatment. In fact, in the immense majority of cases (and our hospital practice shows this clearly,) when we examine a patient with an affection of the heart, we find a lesion of one of the orifices, and almost always, it is the left side which is at fault; therefore, we shall treat almost exclusively the alterations of the orifices of the left side of the heart, and the disturbances which these produce in the cardiac functions.

From the stand-point of internal pathology, authorities have multiplied the divisions of heart diseases, and they have successively studied as special affections, not only the several alterations of the orifices, but also the troubles which arise therefrom.

From the stand-point of therapeutics we can very much simplify matters, and you will see that all is summarized in the study, on the one hand, of the lesions which affect the mitral orifice, and on the other, of those which affect the orifice of the aorta. This division is important, and because certain authors have not well observed it, great confusion has been wrought in the study of the treatment of cardiac affections.

We shall then occupy ourselves successively with lesions of the mitral and lesions of the aortic orifices. But before setting forth the means at the disposal of the physician for treating these respective lesions, we shall preface each of these heads by a brief exposition of the concatenation of the different morbid phenomena which have these lesions for their point of departure, and which by their aggregate constitute the heart diseases.[1]

Michel Peter in his Lessons on Diseases of the Heart has described, in a masterly manner, the progress of these alterations, and he has indicated to us how, from being the local affections which they were at first, they soon become general diseases. Let us then commence with mitral lesions, and take as an example, a patient, who, as a sequence of an attack of rheumatic endocarditis, has developed lesions of this orifice. We are not obliged to distinguish, from a clinical point of view, insufficiency from stenosis, for the one always produces the other, and we have yet

to find isolated cases of the one or the other of these affections.

The first effect of this double alteration will be to produce a distention of the left auricle; on the one hand, because the circulating blood being retarded in its passage from the auricle to the ventricle will accumulate in the former; on the other hand, because at each contraction of the ventricle a part of the blood will flow back into the auricle. At the end of a certain time this distension will attain the pulmonary veins (Rigal has well shown this alteration of the walls of the vessels in the heart affections);[3] then little by little there is stasis in the entire pulmonary circulation. In order to overcome the obstacle thus interposed to the exercise of its functions, the right ventricle, charged with regulating the lesser circulation, is obliged to work harder and undergoes both hypertrophy and dilatation. The right auricle participates in the distention which reaches the great veins, and the stasis becomes general throughout the venous system. The greater, or arterial circulation, is now affected in its turn, and the left ventricle becomes hypertrophied and dilated in the endeavor to overcome the obstacle opposed to its function; this hypertrophy is compensatory.

But in the course of the venous system important organs are involved, organs which have a preponderating influence in blood formation, the liver and the kidneys; thus to the mechanical troubles of the cir-

culation, we see little by little succeed profound alterations of the blood, and then supervenes that particular condition described under the name of cardiac cachexia.

I have thus endeavored to show you that the heart plays a compensatory part, and in this respect I am in accord with the luminous ideas of Beau on "Compensatory Hypertrophy."

For Beau has made it clear that if an obstacle presents itself to the regular working of the heart, the latter, in order to overcome the obstacle, contracts with greater energy, and this increase of labor brings with it an augmentation of the heart muscle. Therefore, we ought not, as the old authorities taught, to oppose this hypertrophy, but, on the contrary, to favor it, and the entire treatment of chronic diseases of the heart is summed up in one brief sentence—*make the heart equal to its task.*[1]

But every exaggerated physiological work of muscle, if it brings with it an increase of volume of the muscle, produces also phenomena of chemical combustion which modify rapidly the structure of the muscular fibrillæ, so that they lose their contractile properties. The cardiac muscle does not escape this general law; to the physiological augmentation of its muscular elements soon succeeds a granulo-fatty degeneration, and then supervene the local troubles of the heart, then general perturbations of the circulation, then finally, cardiac cachexia, because the heart

has become powerless to compensate the lesions whose starting point was the hypertrophy.

Fernet and Huchard have recently characterized these different periods of cardiac affections by special names. They have applied the term *eusystolic* to the period in which the cardiac lesion involves alteration of the myocardium; that of *hypersystolic* to the period when hypertrophy comes in to compensate the troubles due to the lesion of orifice; that of *hyposystolic* to the stage when equilibrium is broken and compensation becomes insufficient; lastly, that of *asystolic* to the period of fatty degeneration; it is this latter state which Gubler characterized by the name of *cardioplegia.*[1]

GENERAL RULES OF THERAPEUTICS.

So then, gentlemen, to the first rule which we have laid down respecting the therapeutics of the heart, we will add another, and the whole will now read: *make the heart equal to its task; oppose, as far as possible, the granulo-fatty degeneration of this organ.* This formula sums up the whole therapeutics of mitral affections. But in attaining this generalization, we have had to pass through several successive phases, the history of which is of great interest.

We must assign a relatively recent date to the therapeutics of affections of the heart, and it is not until the end of the last century that we find the first elements of a rational treatment. Until that period, and notwithstanding the immortal discovery of

Harvey (1619 to 1623), clinical attainments were meagre, and therapeutics backward. Senac (1749) was the first to trace for us a methodical tableau of these affections, and suggest the means of treatment. Corvisart (1811) completed this study, and for many long years these two authorities furnished the therapeutical indications applicable to cardiac maladies. But Avrenbrugger (1760) then Lænnec (1819), by their discoveries, supplied the data for a more precise study of diseases of the heart; they isolated the affections of the orifices, distinguishing them from that augmentation of volume which alone had attracted the attention of preceding physicians, and which, under the name of *active or passive ancurism of the heart*, constituted the dominant disease, against which all the efforts of therapeutics were directed.[4]

Bouillaud by his memorable researches demonstrated the etiology of these affections, and little by little, by virtue of the graphic methods the study of which Marey has pursued so far,[5] and the constant progress of physiology, the mechanics of the heart became much more completely known, and clinical observation determined each of the cardiac movements, and followed the connections.

While physiologists and clinicians were thus analyzing the cardiac affections, pathological anatomy was making progress; it was pointing out to us the intimate lesions of the myocardium; it was explaining to us by these alterations, the error committed by our

predecessors, who, seeing mechanical troubles of the circulation coëxisting with voluminous hearts, had confounded the two widely different periods of cardiac enlargement, the hypertrophy, on the one hand, and the granulo-fatty degeneration, on the other.

COMPENSATED DISEASES OF THE HEART.

From a therapeutic point of view, we must then ascribe a fundamental importance to the modifications which the heart-muscle undergoes in consequence of alterations of the orifices. We shall divide the affections of the mitral orifice, which occupy us more particularly at this moment, into two periods. In the first, the lesion is compensated, that is to say, by increase of power and volume the heart opposes the local and general disturbances; in the second period, on the contrary, compensation is impossible. It is then that we see successively unfolded all the phenomena characterizing the confirmed disease; a disease which, beginning with local troubles of the heart, ends, by successive stages, in cardiac cachexia.

The remedial measures at the disposal of the physician vary according to the different periods. We shall begin by setting forth the treatment of diseases of the mitral orifice when compensation has been effected, *i. e.* in the eusystolic and hyperystolic periods of Fernet and Huchard.

Hygiene has the principal rôle in the therapeutics of these affections, therefore, I shall insist strongly

on the leading hygienic indications which the physician ought to fulfil; they have to do principally with exercise and diet.

Exercise has an importance that is considerable in the development of affections of the heart. You know, in fact, that in the physiological state, under the influence of prolonged and sustained efforts, the heart suffers a brief asystolia; this state, which has been described as *fatigue and overwork of the heart*, disappears rapidly in individuals whose heart is sound, but presents a certain gravity in persons affected with a lesion of the mitral; and it is easy of comprehension how prolonged exercise augments the mechanical trouble of the circulation. Therefore, patients with mitral affections should be allowed regular exercise, but moderate, not prolonged, and in the case of children, you must interdict gymnastics, excursions, ascensions, and rapid walking and running.

CHOICE OF PROFESSIONS.

You will often be consulted by parents as to the choice of a profession for a young man with a mitral lesion as the result of an attack in infancy of acute articular rheumatism. You will, of course, advise those occupations which demand little muscular effort, and especially those which permit a sedentary life. But, in good earnest, what you ought absolutely to proscribe, is the practice of our profession, which, besides the daily draught on the emotions, necessitates

on the part of the practitioner, great fatigue of body, as well in performing the long journeys, if he practises in the country, as in mounting stairways, if he lives in a large city.

Exercise and manual labor have so preponderating an influence in mitral affections, that we have to recognize from the point of view of prognosis, a considerable difference between the man of ample means who can dispose of his time as he pleases, and the day-laborer who is obliged to toil incessantly for his support.*

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* Tasks, marches, prolonged running, etc., seem to be the cause of certain affections of the heart, hence it is that hypertrophy of that organ has been often noted in soldiers, hunters, and foot-racers (Beau) and, to cite recent facts, German physicians claim to have observed, since the late war, cases of hypertrophy of the heart, which they attributed to the tasks and fatigues of the campaign.

Other causes may also be assigned: thus, an English physician, Myers, calling attention to the frequency of cardiac affections in the English army, signalizes, as having a great influence on the circulation, the form of the apparel, the equipment, the tightness of the uniform, which by constricting the neck, impedes the circulation; and this cause may be invoked, for a still greater reason, in the case of the young soldier, whose thorax, not yet ossified, is compressed by the uniform, which hinders the complete dilatation of the chest. In this connection, it is well to remind women, especially those who are liable to, or are suffering from any cardiac affection, that tight lacing, by reducing the capacity of the chest, disturbs the free working of the heart and lungs, and is sure to aggra-

The influence of social inequality is here conspicuous; while the first may mitigate and retard to a more or less remote period all the phases of his malady, the other, on the contrary, as soon as he renews his daily tasks, experiences a return of all the mechanical troubles of the circulation.

This is what we observe every day in our wards; you see men yet young and vigorous, who, carrying about with them a mitral affection, come to the hospital to combat the first local symptoms of their disease. Rest, and the application of well understood hygienic principles, cause these local symptoms to disappear, and the man to recover his vigor, but as soon as he resumes his customary work, the same symptoms are reproduced under the influence of fatigue, and he is again compelled to enter the hospital. Thus the laboring man, who would otherwise

---

vate any existing disease of the heart, if it may not determine an actual lesion of that organ.

Among the professions which should be forbidden cardiac patients, are the following:

1. Those which entail much exposure to cold and wet (washerwomen, etc.), and which may cause rheumatism.

2. Those which demand severe muscular exertion, (blacksmiths, baggage-men, market porters, bakers, etc.)

3. Those in which one is obliged to breathe impure air, or air charged with noxious principles, such as lead, (cardiac lesions of lead poisoning indicated by Durozier).

4. The profession of miner which predisposes to anæmia.

5. That of sailor and soldier.[6]

be capable of efficient toil, is disabled from all continuous labor by the fact of his heart disease.

DIET.

By the side of exercise we must place diet which plays an important rôle in the treatment of diseases of the heart (7).

At the epoch when it was considered necessary to subject patients with hypertrophy of the heart to depleting treatment, Sénac, Morgagni, Scarpa, Valsalva, Albertini, Corvisart and others, made a spare diet one of the principal elements of their therapeutics, and this mistake was perpetuated until the beginning of this century. Never, gentlemen, has low diet had a favorable influence on the progress of a mitral or aortic lesion. It can only favor the enfeeblement of the heart muscle, and through that, the development of mechanical troubles of the circulation. These erroneous views are to day abandoned, and a nourishing and invigorating regimen is uniformly advised for cardiac patients.

But it must be understood that this regimen must not exceed certain limits ; it is necessary that the food which is taken shall be rapidly digested, and that it shall not determine in the stomach a distention oppressive to the functions of the heart and lungs ; in a word, it is necessary that the diet shall be substantial and supporting, but in little bulk.

It is moreover essential that the abdominal

functions shall be regularly performed ; avoid constipation ; combat it, when existing, by mild laxatives (aloes for example), or by the purgative mineral waters (Pullna, Freiderichshall, Hunyadi Janos).

USE OF ALCOHOLIC DRINKS.

But if you may be liberal in the variety of foods and drinks which are permissible to cardiac patients, there is, nevertheless, one point concerning which the utmost caution and reserve are necessary ; I refer to the use of alcoholic liquors.

Limited to a wineglassful after meals, alcoholic stimulants have no injurious effects, they promote the digestive function ; but it is not so, when, passing this limit, an abuse is made of these beverages. This abuse is most prejudicial to all heart affections, and cannot fail to forward that granulo-fatty alteration whose coming we ought to retard as much as possible.

By the side of alcohol we must place the abuse of tea and coffee. These beverages, which are excellent heart tonics, produce, when indulged in to excess, palpitations and irregularities, concerning which Stokes and Percival long ago wrote, (8). I have known patients who could not use tea and coffee, even in moderation, without experiencing intermittences and other troubles on the part of the heart. I know well however, that usage modifies these effects, and in permitting or proscribing these beverages, you must consult the habits and idiosyncrasies of your patient.

USE OF TOBACCO.

Tobacco, like alcohol, is dangerous to cardiac patients and should be altogether interdicted. If, in fact, we leave to one side certain troubles of short duration, and even a species of chronic poisoning determined in man by the abuse of tobacco, we find that tobacco, or, more strictly speaking, its alkaloid nicotine, has a quite special action on the spinal cord and nervous system. In large doses, as Claude Bernard has shown, it increases the beatings of the heart, and produces intermittences, and this explains to you how disastrous are its effects in every form of cardiopathy. Graves, Beau, Jolly, Decaisne, Bertillon have for a long time called attention to these facts, and everybody now knows that peculiar form of angina developed by the use of tobacco. Forbid smoking then to your patients, as well as living in an atmosphere charged with tobacco smoke. Endeavor to convince them of the grave consequences sure to result to them if they do not put an end to a vicious and dangerous habit which cannot but aggravate their complaint.*

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*Nicotine is one of the most violent poisons known; a few drops let fall on the cornea of an animal will kill it almost instantly.

By the symptoms which follow its absorption, and by its toxic activity, this alkaloid resembles prussic acid.

Nicotine acts chiefly on the pons and medulla-oblongata. In small doses it quickens the beatings of the heart (Claude Bernard); this acceleration, according to Traube, is preceded

MORAL HYGIENE.

By the side of these grand precepts of hygiene, must be mentioned moral hygiene, which is no less important, and it is well to remember that just remark of Michel Peter: "the physical heart is the counterpart of a moral heart." In fact, all passions, political and social, all strong emotions, have a direct influence on the heart; they increase its action and thus aggravate any existing disease. It is well, then, that the cardiopathic should shun excitements, of whatever kind—that he should eschew gaming, poli-

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by a stage of slowing. In toxic dose, nicotine always produces acceleration of the heart but without the initial slowing. On the blood vessels, nicotine in small doses has no effect, but in toxic doses, it augments the contractility of the vessels and the vascular tension.

According to competent authorities, one has only to smoke a pipe or cigar to note a marked acceleration of the pulse, which is quickened 5 to 12 beats a minute by the act of smoking; slowing has not been observed.

The sphygmographic tracings indicate an augmentation in the force of the beats. G. Sée considers nicotine as a vaso-cardiac poison; he thinks that its influence on digestion and the secretions is but secondary.

Decaisne has observed twenty one cases of intermittence of the pulse, independent of any organic lesion of the heart, in eighty-eight incorrigible smokers. The abuse of tobacco, he says, may produce a pathological state which he calls *narcotism of the heart*, and which manifests itself by intermittences in the beatings of this organ, and in the radial pulse. Jolly and Bertillon have confirmed these observations, (9).

tics, the cares of business, speculation; in a word, that he should cover himself, as it were, with a thick coat of mail, which shall be impenetrable to all those emotions whose assault cannot but aggravate his condition and accelerate the march of fatal consequences.

CLIMATE.

What climate shall you recommend to patients suffering from cardiac diseases? Above all, mild temperate climates, with cool, rather than warm weather. Avoid climates that are excessive; in cold climates, pulmonary troubles are frequent, and these affect unfavorably the functions of the heart; in too warm countries the patient will have to contend with the anæmia so common in torrid regions, the intestinal troubles, diarrhœas, dysenteries, malarial poisonings, and numerous other causes of general debility.

Recommend to your patients to shun sudden variations of temperature, and air too much charged with moisture. The cardiopathic should choose a well-aired habitation, little exposed to violent currents of air, and consequently, rather in a valley sheltered from winds and from moisture, than on the top of a hill, or in a mountainous situation.

What estimate are we so place upon baths, and how far may we expect good results from hydrotherapeutics in general.[13] I have but little to say respecting baths of compressed air; this question is still undecided, and the results obtained are too uncertain to

enable us to draw precise data therefrom. The weight of authority seems, however, to be against their usefulness in cardiac diseases.*

As for warm baths, you may permit them to your patients; indulged with prudence, without being too prolonged, or too often repeated, they are without inconvenience. But it is not so with baths that are too warm, or with sea or river bathing in water that is

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* From the point of view of the advantages to be derived from aerotherapy in the treatment of affections of the heart, there are two opposite opinions. Some, as Ducrocq, regard compressed air as inefficacious in diseases of the heart, and even deleterious. Fontaine adopts the same view, thinking pneumotherapy contra-indicated in valvular and hypertrophic affections.

Schnitzler, of Vienna, is of the same opinion.

Other authorities, as Waldenburg, regard inspirations of compressed air as indicated in affections of the left heart, mitral and aortic insufficiency, and in stenosis of the left venous and arterial orifices. Expirations in rarefied air are indicated in diseases of the right heart (tricuspid insufficiency, stenosis of the right heart).

Lambert, who has repeated Waldenburg's experiments, believes also in the efficacy of compressed air, which he compares in its action to digitalis, like that drug, regulating the heart's action.

Digitalis, however, at first augments the contractile force of the heart, and the congestion and other morbid phenomena disappear subsequently, while in the case of compressed air, the congestion disappears first, and the regulation of the circulation comes afterwards.

According to Lambert, baths of compressed air facilitate

cold; such baths, like vapor baths, cannot but do harm, and must be forbidden. In fact, cold water, and especially sea water, is likely to provoke multiple accidents, and among these, active local congestions, especially of the lungs; these, you well know, cannot but augment the disturbance of the lesser circulation, which is one of the first of the manifold evils so prone to follow in the train of mitral lesions.

Have a general oversight, then, of your patients; recommend to them caution, and remember that disastrous results have often followed sea-bathing, practised inconsiderately by cardiopathics.

Some medical authorities, however, have thought that hydrotherapy might be beneficial, despite the facts reported by Fleury, Bouillaud, Michel Peter, and others,[12] I would advise you to be shy of this means of treatment, and when reading the observations cited in support of the employment of cold douches in mitral affections, we are led to ask if these cases were

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the systole. There is lessening of the work of the left heart, and augmentation of the work of the right; disappearance of the pulmonary congestion and dyspnœa; increase of the vital capacity; and the respiratory changes in the blood are more energetic.

In hypertrophy of the left ventricle, good results follow this treatment, lowering of arterial tension, diminution of pulmonary congestion.

Lastly, Lambert advises inspiration of compressed air in valvular affections.(11)

not rather cases of anæmia and functional disturbance, than veritable lesions of the heart. For my part, I agree with Beni Barde that hydrotherapy is contra-indicated in compensated affections.

This leads me to speak of the use of mineral waters, and to ask if there exist natural waters having a curative influence on affections of the heart. I think not. Dr. Dufresse de Chasseigne, however, maintains that the waters of Cantal and Bagnols (Lozère) have a curative action on hypertrophy of the heart; he has cited numerous observations where he pretends to have cured aneurism of the heart by the employment of these waters.[13] He has gone even farther; he has localized in the sulphurets common to these two springs, the special element that is beneficial. I believe that Dufresse de Chasseigne is laboring under a delusion. To cure hypertrophy in a patient affected with mitral lesion, would be a sad service to render him; it would have to be shown, then, that these waters have a special action on the damaged orifices; a difficult matter to demonstrate.

I think, therefore, and here I am in agreement with Bordeu, Durand Fardel, Candellé, that mineral waters, and particularly the sulphurous waters, have an injurious effect upon the course of heart diseases, and are contra-indicated.[14]

These sections on hygiene, gentlemen, would be incomplete if I did not speak of the influence of

pregnancy* on the march of affections of the heart, for this condition has a predominating influence from the point of view of the hygiene of females who are the subjects of mitral valvular lesions.

Since Larcher has demonstrated the hypertrophy of the heart accompanying pregnancy, and especially,

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* Pregnancy produces changes in the blood, altering its chemical quality, and causes hypertrophy of the heart. According to Larcher and Ducrest, the thickness of the left ventricle may increase by one-third or three-fourths. Blot has proved that the weight of the heart during gestation rises from 220 or 230 gms. to as much as 292, and Durosier, by careful percussion, has demonstrated also this augmentation of volume (Bulletin of the Society of Medicine of Paris, 1868).

These new conditions of the blood and of the heart are temporary, and cease after delivery; they are not, then of very great importance to the healthy woman, who is, nevertheless, according to Lotz and Auguste Olivier, sometimes affected with puerperal endocarditis; the cardiac patient, however, is likely to suffer severely from these changes in the blood and in the heart substance.

Heart disease and pregnancy, in fact, react upon each other. The health of the woman, her life even, as well as that of her child, are gravely compromised by the fact of the cardiac affection, and dangerous symptoms may supervene during the course of gestation, at the commencement or termination of labor, and even subsequently. Beside attacks of suffocative catarrh, mentioned by Peter, which supervene about the fifth month, one is liable to see an immediate aggravation of the heart disease, and if there is now and then a woman who passes the period of pregnancy with impunity, there are, unfortunately,

since Durozier, Peter, Sée, Budin, Martin, Angus MacDonald, have traced so clearly the influence of pregnancy on affections of the heart, and of the latter on pregnancy, the physician ought to have his attention directed to these points, and be prepared to instruct females affected with disease of this organ that pregnancy is sure to aggravate the situation.

This influence is really two-fold, and facts go to show that if, on the one hand, pregnancy augments the

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others in whom the disease will be found to have made rapid progress during the period of gestation.

Cardiopathic patients are always in danger of miscarriage (out of 41 patients with heart disease, Durosier noted 21 abortions or premature births), hemorrhages, either before or after delivery, syncope, ruptures of the heart, even sudden death, a few days or hours after confinement.

Cases of death are less frequent for the mother than for the child; birth takes place at seven months, or seven months and a half, and the child comes into the world still-born, or dies in a few days, or lives a few months, or even years; (Durosier noted that out of 40 children born of cardiopathic mothers 37 died early, before attaining the age of six years.

All cardiac lesions have not quite the same unfavorable prognosis; from the point of view of abortion, the most untoward form is mitral insufficiency, the mildest, aortic insufficiency. According to G. Sée, mitral constriction is less dangerous, as far as labor is concerned, than mitral insufficiency.[15]

The most serious complications, and the greatest danger of death for the mother, appear the seventh and a half, or the eighth months. In presence of this fact, is the physician warranted in inducing premature labor? Durosier replies in the affirmative, and a great many obstetricians say the same.

hypertrophy of the heart and hastens the granulo-fatty degeneration of that organ, on the other hand, miscarriages are .frequent occurrences with women affected with heart disease.

After delivery it is well understood that the mother is not to be allowed to nurse her infant.

The question of marriage is one which every woman with heart disease ought seriously to consider. These are Angus McDonald's conclusions:

1. Chronic diseases of the heart ought to be regarded as a serious contra-indication to marriage, especially if they present the form of mitral stenosis or aortic insufficiency.

2. In simple mitral insufficiency the danger is less great.

3. In every case where the physician is consulted, he ought absolutely to forbid marriage, where the cardiac disorders: dyspnœa, palpatations, hæmoptysis. are very marked, and this, especially, when the patient is young, and the disease of the heart recent.

4. Married woman should not be allowed to nurse their infants, because lactation seems to augment the hypertrophy of the heart.

5. During pregnancy, and especially during the last months, the patient should use the utmost care not to take cold, and should avoid fatiguing exercise.

6. In every case chloroform inhalations may be used with advantage during labor.

7. All means suitable for diminishing the efforts of the woman during parturition ought to be employed; hence the judicious or opportune application of the forceps, or of version, is very important. In cases of hydro-amnios, the rupture of the membranes, practised in time, will render the greatest service in permitting the descent of the diaphragm.

Professor Verneuil, who has applied with so much success to the study of surgery the data of general pathology, and who has pointed out to us the influence of the great diatheses on traumatism, and *vice versa*, has not omitted the affections of the heart; he has shown the injurious influence of traumatisms on cardiac maladies, and of these latter on the progress of lesions resulting from external causes.

MEDICINES.

The drugs of the Materia Medica have but a secondary place in the treatment of compensated diseases.

Digitalis is contra-indicated, and when we come to speak of the non-compensated maladies, I shall show you that it is in these cases alone that digitalis ought to be employed. Marvelous medicament when it is managed as it ought to be; when not managed properly and not indicated, it cannot but give deplorable results. If complaint has been made of the employment of digitalis and its preparations, if the dangers thereof have been pointed out, if even certain physicians have abandoned the use of this valuable therapeutical agent, it is because the necessary precautions have been neglected. Bear in mind, then, that digitalis is inadmissible in compensated affections.

Iron has been extolled, and the English physicians, in particular, Scott, Alison, Jones, have stated the advantages which may be derived from a ferrugin-

ous treatment. Notwithstanding the opinion of these authorities, I fear that a mistake has been committed, and if iron and the martial preparations have seemed to do good in cardiac troubles, I feel confident that the treatment had to do with anæmic difficulties rather than with valvular lesions.[16]

Therefore, even despite the valuable tonic properties of iron—in consideration of the congestions which may follow the administration of the ferruginous preparations, I am rather inclined to prohibit than to order them, even if the mitral affection be accompanied with anæmia. I much prefer quinine, and especially arsenic.[17]

Arsenic, in fact, in the anæmia of certain affections of the heart, will give you all the advantages of the martial preparations, without any of the disadvantages; over and above its tonic action on the heart, it stimulates the general functions, improves the appetite, and by this, if in no other way, combats the anæmic disorders.*

Among the medicaments, I must mention bro-

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* Lockie, of Cumberland, considers arsenic as a cardiac stimulant, and thinks that it is a useful adjuvant to digitalis in non-compensated valvular affections. He claims that it is of efficacy even where there is fatty degeneration.

Sée claims that arsenic is a cardiac accelerator, having a paralyzing action on the vagus centre. Others (Hardy, Briquet, Gubler, Bebier, etc.,) hold a contrary view.

It appears, then, that the question is not yet settled.

mide of potassium, whose use will be more especially indicated when I come to treat of the non-compensated mitral affections, but which may, even in the first phase of the disease, render great service. In fact, in the case of a good many patients (and especially nervous females) at the onset of mitral affections, pains supervene, sensations of oppression, insomnia, phenomena purely nervous, and which are alleviated by bromide of potassium. This remedy may be prescribed to advantage as follows:

℞ Bromide of potassium, grammes xv.
Water, " ccl.

M. Sig. A tablespoonful in some bitter infusion, or in milk. You may use as a vehicle the syrup of bitter oranges instead of water.

As for ptisans, they are of but little consequence, though certain authorities have vaunted their utility. Thus Williams and Sylvestre have recommended *pepergrass* (Lepidium iberis), in powder, in the dose of 15 to 20 centigrammes (2 to 5 grains). This herb belongs to the cruciferæ, and is slightly aromatic and stimulant. Lombert, of Geneva, has noted good results from polygala senega (the Virginian snake root), while Andral recommends the syrup of asparagus shoots. But we repeat, these herbal preparations are of only hypothetical utility.

Such, gentlemen, is the sum of therapeutical measures at the disposal of the physician for treating the

compensated mitral affections, and as I said in the beginning, you see that the principal part appertains to hygiene. It is by virtue of careful attention to hygiene that we are able to retard the manifestation of disorders which characterize the second stage of these affections; a period better known, and which demands therapeutics of a more active kind, to which I shall devote the next lecture.

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CHAPTER II.

HEART TONICS.

SUMMARY.—Non Compensated Diseases of the Heart—Heart Tonics—Direct Action on the Heart—Innervation of the Heart—Digitalis—Its Physiological Action—Its Advantages and Dangers—Digitaline and Digitalis—Preparations and Doses of Digitalis—Administration of Digitalis—Digitaline—Pills, Infusions, and Tinctures, of Digitalis—Means of Introduction of Digitalis—Hypodermic Injections—Cataplasms, Frictions and Lavements of Digitalis—Indications and Contraindications for Digitalis—Convallaria—Bromide of Potassium—Coffee and Caffeine—Strychnine.

GENTLEMEN: You have seen from the previous lecture that it is chiefly on hygiene that the physician must rely to oppose the progress of mitral affections when they are said to be compensated. Something more, however, than hygiene is needed when, on account of the heart muscle being inadequate to perform its task, the first symptoms of mechanical troubles of the circulation appear. Medicinal treatment then becomes imperative to meet the numerous distressing complications which arise. To the disorders pertaining to the heart, the intermittences of the pulse, palpitations etc., are soon added disturbances on the part of the lesser circulation, dyspnœa makes its appearance, the mechanical perturbations augment,

and soon the patient presents all the signs of the heart affection at its maximum.

To combat these symptoms, the physician possesses therapeutic means which mainly fulfil the following indications: To raise and augment the tonicity of the heart, to promote the disappearance of the serosity which tends to accumulate in the cellular tissue, and to oppose the various local congestions which arise. We shall take up each of these heads in its turn, and we will begin with one of the most important, namely that which pertains to the CARDIAC TONICS.

You know what importance I attach to the state of the heart muscle. I have shown you that this subject has a predominant interest to the therapeutist, and that the rôle of the physician is not to do away with or cure the lesion of the endocardium (which of course is an impossibility), but to endeavor to put the heart muscle in condition to struggle to advantage against its obstacles, while, at the same time, opposing the granulo-fatty degeneration, often the inevitable consequence of this increase of work.

THE CARDIAC INNERVATION.

Constituted by striated fibres, the heart muscle (') is innervated by nerves which take their origin from the great sympathetic and cerebro-spinal axis. The study of the functions of these nerves has intensely interested modern physiologists, and if all the points connected with this subject are not yet elucidated, we

have acquired respecting the cardiac innervation precise data which it is important to know, if one would estimate at their proper value the action of cardiac medicaments.

The heart receives from the nervous system two opposite influences: the one tends to put this muscle in movement, the other to moderate and restrain its movements; and it is to the harmonious play of these two influences that we owe the regularity of the cardiac contractions. If one of these influences happens to predominate, there are immediately produced disturbances more or less profound in the rhythm of the heart.

The excitatory nerves are furnished principally by the great sympathetic, and indirectly by the cord; the moderator nerves, on the other hand, are derived almost exclusively from the pneumogastric. Cyon and Ludwig have shown us this curious fact, that the chain of nervous ganglia which surrounds the heart constitutes a true nervous centre, giving off nerves, and in particular the nerve of Cyon, which terminate in the ganglionic system of the abdominal organs, and subserve the harmonious regulation of the cardiac and abdominal circulation.

Such, in brief, is the innervation of the heart, and you readily understand from this exposition that medicaments may modify the conditions of the cardiac circulation, whether by acting on the motor nerves, directly or indirectly, or on the moderator nerves; and we

shall presently see the application of these data to the *modus operandi* of the heart tonics, whose consideration we shall now take up.

DIGITALIS.

We must assign the first place to digitalis, that *quinine of the heart*, to use Beau's expression. Digitalis is undoubtedly the most powerful strengthener of the heart (it is in fact the type of heart tonics), and experiments on animals with the hæmodynamometer, and the sphygmographic tracings obtained in man by Bordier and Ferrand, show clearly that digitalis augments the pressure in the circulatory system, and that this action is attained by greater energy of the ventricular systole. Whether this stimulation be due to a direct influence on the muscular fibre of the heart, or on the intrinsic nerves of this organ—to a sort of *galvanization* of the heart, to use Gubler's expression, or whether it be due to an excitation of the moderator nerves of this organ, and in particular of the inhibitory ganglion of the heart, as Germain Sée thinks, the fact is none the less admitted to-day by all therapeutists. It may even be said that this action does not stop with the heart itself, but seems to extend to the entire circulatory system.(2)

But before taking up the study of the management and doses of digitalis and its preparations, it is well to recall certain points connected with the physiological action of this medicament. I shall allude but

briefly to the emeto-cathartic action of this drug; you all know, in fact, that the tolerance of this medicine is of short duration, and that when its administration is too prolonged, it produces diarrhœa and vomiting. I must call your attention particularly to this fact: that digitalis is eliminated slowly from the economy, and that it continues its physiological action for a long time, so that, for instance, in a patient who has been taking digitalis, you will notice a diminution in the beatings of the heart for eight days after discontinuance of the medicine.

This cumulative action produces in individuals who have long been under the influence of digitalis exhaustion of the heart's irritability, which leads to a veritable therapeutic asystolia. The treatment badly managed, instead of giving the patient relief, as you see, aggravates his condition. I have, for my part, now and then observed, both in private practice and in the hospital, patients too long under digitalis in whom simple suspension of the medicine sufficed to produce a marked amelioration.

This fact is easily explained when we refer to the experiments of Rabuteau and Mégerand, who have shown that in animals to which digitalis has been for a long time administered, there is produced a real granulo-fatty degeneration of the heart muscle. Nor is this all. Durozier, and more recently Cloetta, have pointed out instances of true delirium produced by digitalis when too long given. (The latter has cited

four cases of the cumulative effects of this medicament, a delirium, like the delirium of alcohol, supervening. Simon and Berg have noted similar instances.)

Struck by these facts, certain observers have been led to consider digitalis as a medicine which is dangerous and often inefficacious. Yes, digitalis is dangerous when ignorantly and unskilfully administered, but I shall show you that in carefully watching its effects, and in following certain rules, one may derive marvelous results from this truly heroic medicament.

These rules, gentlemen, are a logical inference from the facts above cited. Digitalis, as I have told you, under certain circumstances has an emeto-cathartic action; to obviate this evil, endeavor to obtain tolerance by giving moderate doses. Above all, do not forget to suspend the treatment after giving the medicine a few days; thus you can make your patient take moderate doses of digitalis for four, five, or six days, then stop it for a little while, to resume it again. By this means you will avoid the cumulative action and the emeto-cathartic effects, while obtaining at its maximum the tonic influence on the heart.

Never leave the patient free to continue the medicine himself; watch attentively the effects obtained, and do not say, as some physicians have done: "take digitalis," without indicating when, how, and for how long a time—in a word, without an attentive surveillance, on your own part, of the treatment.

But it is not enough to know the general rules for

the administration of digitalis; there are certain particulars which are important, and some suggestions are necessary as to the preparations which you ought to choose.

Whether is it better to give digitalis or digitaline? This question brings before us one of the therapeutical problems which has been of late agitated, to wit: the substitution of alkaloids for medicaments of vegetable origin.(*). To substitute for a plant whose power varies according to the place where it grows, according to the time of the year when it is gathered, according to species and even according to varieties, according to the methods of preservation employed—to substitute, I say, for so uncertain a vegetable product, a chemical body which contains all the medicinal properties of the plant, and which, owing to its constant and fixed composition, always has the same power and the same action, seems to be based on reason and common sense, and we have seen in our time Burggraeve found a new therapeutic method on this principle.*

In therapeutics, as in many other things, exclusive systems are always bad. Certainly, the knowledge of new alkaloids and their introduction into medicine have constituted a great step in advance, but to substitute them under all circumstances for the plants from which they are extracted, is a mistake. In fact, in the plant or herb employed, there is not merely the alkaloid—there are other substances which have an

* Burggraeve, Médecine dosimetrique.

important action, and in most cases, when we give the herb, we obtain a therapeutic result which is derived from all the constituent principles. Thus, for example, opium has not precisely the same action as morphine, and the other alkaloids contained in opium have a share in the effects obtained. So, also, quinine has not exactly the same action as cinchona, nor atropine exactly the same action as belladonna. If in certain cases the effect of the alkaloid is sought for, in others it is desirable to get that of the plant in its entirety.

What I have just said of these drugs applies absolutely to digitalis. The analysis shows us, in fact, that in the midst of divers principles existing in the leaves of this plant, there are several active bodies. But despite the numerous researches which have been made respecting this subject, there are difficulties which have not yet been removed. The chemical discoveries have enabled us, it is true, to recognize a body which seems to possess the characteristic properties of digitalis, namely digitaline, which is not from a chemical point of view an alkaloid, as it does not form definite salts with acids, but rather a glucoside; there have also been successively found digitalines differing, both from a chemical point of view, and from that of their therapeutical energy. The German digitaline is not the amorphous digitaline of Homolle and Quevenne, and the latter is not the crystallized digitaline. Despite the discovery of Nativelle, which has been a real progress towards the elucidation of this vexed

question, it is by no means certain that there are not other digitalines differing still from the preceding.*

In consequence of this confusion, and despite the favorable results which have been obtained from this alkaloid, I am of the opinion of Prof. Regnauld, that the digitalines ought, in great measure, though not altogether, to be banished from therapeutics, and that we should still adhere to the leaves of digitalis, and the diverse preparations made therefrom. I am well aware that the leaves do not always have the same energy of action, but this disadvantage, which, however, our leading pharmacists have reduced to its minimum by laying down precise rules as to the time when the leaves should be gathered and how they should be preserved,' is largely compensated by the physiological, and especially by the diuretic action, which is so easily obtained from digitalis, and with such difficulty from digitaline. You will see, gentlemen, what a powerful rôle this diuretic action plays in the therapeutics of non-compensated mitral affections.

To what preparations shall you give the preference? Are you likely to get the best results from the pills, the infusions, the syrups, or the tinctures? This

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* The name of *glucoside* has been given to certain natural products of the vegetable kingdom, which, when put in presence of a feeble mineral acid, or a ferment, give rise to glucose. Thus it is that digitaline is transformed, according to Kosmann, into digitaliretin and into sugar, according to the following formula: $C^{97}H^{46}O^{15} \times 2HO - C^{5}H^{5}O \times 2C^{6}HO^{6}$.

is an important question, which merits a few minutes attention.

Of all the preparations of digitalis leaves, the worst is certainly the pill. In fact, as Gubler has shown, the powder of the leaves is itself irritating, and when brought into contact with the mucous membrane of the stomach, it sets up a disturbance, and is likely to produce the emeto-cathartic effect of the medicament; now this is something which you ought to avoid at whatever cost. When, therefore, you give digitalis in pill form, either it is properly made and dissolves in the stomach which it irritates, or being badly made, it resists the digestive fluids, and passes through the digestive tube as a foreign body. If, however, despite these considerations, you order the pills, each pill should contain from 5 to 10 centigrammes (1 to 2 grains) of the powder of the leaves.

The ptisans are far preferable, and it may be truly said that they constitute the best preparations of digitalis; they are of two sorts, the infusion and the maceration.

Hirtz, than whom no practitioner of our day has better understood the management of digitalis, and who, basing himself on the antifebrile action of this drug, has popularized its employ in all the pyrexias—Hirtz, I say, prefers the infusion, which he formulates thus:

Take of powder of digitalis leaves, 50 centigrams (7½ grains).
Hot water (158° F.), 100 grams (f ʒ iij and ʒ ijss).
M.
Infuse half an hour and strain.
Dose, a tablespoonful every two hours until the whole is taken.

Jaccoud has modified this formula, by adding the syrup of digitalis:

Take of powder of digitalis leaves, 50 centigrams (7 ½ grains).
Hot water, 120 grammes (f ʒ iv).
Syrup of digitalis (to sweeten), 30 grammes. f ʒ j).
Dose, the same as of the preceding preparation.

As for myself, I prefer the maceration to the infusion, believing, with Hérard, that it is one of the best preparations, especially if one wishes to obtain the diuretic effects.

This maceration is made as follows:

Take of powder of digitalis leaves, 25 centigrams (gr. v.)
Cold water, 120 grammes (f ʒ iv).
Macerate from six to twelve hours and filter.
Dose, the same as of the above preparation.

It is important that the maceration should not only be strained, but filtered with care; in fact, if there remain any trace of the powder of the leaves, this powder, as I have told you, has an injurious action

on the mucous membrane of the stomach, and is likely to cause vomiting.*

The syrup of digitalis is a preparation particularly applicable to dropsies. We shall return to this preparation when we come to diuretics.†

* Hérard employs the maceration of digitalis (25 centigrammes of the powdered leaves macerated in 200 grms. of water) which he causes to be taken in five or six doses during the day, and continued from eight to fifteen days.

Moutard Martin uses the same preparation, but causes it to be taken rather more freely. He tells the patient to take it all up in mouthfuls every hour, save at meal time.

Blondeau and Labbé, however, think that in some cases it is well to give this maceration at the same time as food.

Constantin Paul gives from 30 to 50 centigrams of the leaves in a quart of water; the whole to be taken during the day.

Bucquoy administers for five or six days 50 to 75 centigrams of the powder of the leaves in 200 grams of water.

All these authorities consider the maceration as the preparation which gives at its maximum of intensity the diuretic action of the medicament; and without denying in the least the diuretic action of digitaline, they think this alkaloid cannot be relied on for diuresis. They regard also the tinctures and the infusion of digitalis as inferior, from a diuretic point of view, to the maceration. According to Gubler, however, all the digitalis preparations, even digitalin, have a diuretic action; he uses the maceration and the tincture, the latter in the dose of ten drops three times a day.

† There are two syrups in common use, that of the Codex and that of Labelonye. That of the Codex is made by adding one part of the alcoholate of digitalis to 40 of syrup. Twenty grammes of this syrup represent five decigrammes of the alco

The tincture is a good preparation, which, as estimated by its therapeutic action, I place next to the maceration. There are two tinctures: the ethereal tincture, which is an untrustworthy preparation and should not be employed, and the alcoholic tincture, or the alcoholate,* which you may prescribe in the dose of ten or twelve drops three times a day.

Thus far I have spoken only of the method *per vias naturales*. I must add that attempts have been made to introduce digitalis into the organism by other channels. Thus the hypodermic method has been tried; this is not a very practical mode of administration, by reason of the local irritant action of digitalis and digitaline. Nevertheless, Gubler has claimed success with digitaline introduced in this manner, and Vimont has likewise reported favorable results. I am, however, of opinion that not much will be gained by

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holate, or thirty-three milligrammes of the alcoholic extract of digitalis; the dose is from one to four ounces, and may be gradually increased.

The syrup of Labelonye is made by dissolving 5 grammes of the hydro-alcoholic extract of digitalis in 300 grammes of simple syrup. Thirty grammes (or about one fluid ounce) of this syrup represent two decigrammes of digitalis powder. The dose is from 30 to 60 grammes (1 to 2 fluid ounces).

*Made by macerating one part of powdered digitalis leaves in five parts of alcohol at 60°. Macerate ten days and filter.

these subcutaneous injections, unless in exceptional cases.*

Cataplasms and lavements of digitalis leaves have also been counselled; Brown and Reynolds have vaunt-

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* These injections have been employed by Otto and Witkowski. The first employs the following solution:

Take of Merk's digitaline, 1 part.
Glycerin, 1 part.
Water, 10 to 20 parts.
M.

He injects $\frac{1}{10}$ of a grain of digitaline in maniacal patients. Witkowski makes use of the following solution:

Take of Merk's digitaline, 0.10 gms.
Water, 29 cubic centimetres.
Glycerin, 5 cubic centimetres.

As a result of these injections, the latter has noticed grave local accidents, and in particular, abscess of the arm, necessitating numerous incisions.

More recently, Gubler, after numerous attempts, has succeeded in obtaining all the effects of digitalis by administering digitaline in subcutaneous injections, after the following formula: Take a 5-per-cent. solution of Homolle and Quevenne's amorphous digitaline, prepared in a mixture of equal parts of water and alcohol; take one gramme of this solution, containing two milligrammes of digitaline, and inject one milligramme—that is to say, one-half of the syringeful.

According to Gubler, asystolia is the result of two different states of the heart, the ataxic state (cardiataxia), and a state of enfeeblement of the contractions (cardioplegia). It is chiefly in cases of ataxia of the heart, where the structure of the heart muscle is still intact, that the preparations of digitalis

circulation is very problematical, and their effect, for the most part, is purely local.

When speaking of the physiological action of digitalis, I told you what are the therapeutical consequences derivable therefrom; I told you how necessary it is to interrupt the treatment, and how important it is to give moderate doses; the subject of dosage may now appropriately be considered.

When you employ the ptisans—whether the maceration or infusion—you may give daily 25 centigrames (5 grains) of the powder of the leaves, and this quantity may be increased to half a gramme (7½ grs.) when it is necessary to resort to very active treatment. As, however, it will be impossible to continue such dosing for may days in succession, you will be obliged to diminish the amount gradually, day by day, for a few days; but whether you give full doses or decreasing doses, take care not to prolong the administration of the digitalis beyond four or five days, then let there be a respite for the same length of time, after which you will resume the medicine so as to alternate the periods of treatment with equal periods of rest.

Digitalis thus administered will often give you marvellous results. But it is not sufficient to know how to manage this medicament, you must also know by what signs you are to judge of the indications for its employment.

INDICATIONS AND CONTRA-INDICATIONS FOR DIGITALIS.

I have told you in the previous lecture that if the heart is sufficient for its tasks, digitalis is useless, even dangerous, while if the heart is insufficient, digitalis is indicated, and the therapeutic results are favorable. Now, by what characters are you to know, in the long evolution of mitral diseases, the moment when the heart becomes insufficient?

In order to guide you in this study, you should, as Peter has shown, never forget that the pulse very faithfully interprets to the touch of the observer the state of the cardiac muscle. The irregularity of the pulse does not depend on the valvular lesion, but on the state of the heart, and this is so true, that with the lesion remaining the same, we may, by suitable treatment, bring back the pulse to its normal type.

Examine, then, attentively the pulse, examine also the beatings of the heart, interrogate the respiratory functions, see if there be any cardiac dyspnœa, look for œdema about the feet and ankles, percuss the region of the liver, and in thus extending your investigations in every direction, you will apprehend the signs which indicate to you that the heart is insufficient for its task, and that medicinal interference is necessary to augment the contractile force of that organ.

But this influence on the muscular fibre is limited, remember, by the integrity of this latter, and when, in

certain affections, this heart muscle has undergone granulo-fatty degeneration, you readily understand that digitalis can have no effect.

Bernheim* has even shown that this fatty degeneration is a formal contra-indication to the employment of digitalis. Now, when digitalis is not necessary, it is, as you know, always dangerous. But, you will ask, how are you to know when the heart is fatty? This will be made plain to you, gentlemen, by the very fact (if in no other way) of the non-efficacy of the digitalis which acts here as a veritable therapeutic test.

When, in a patient, digitalis administered methodically, managed with care, produces no amelioration on the part of the heart and pulse; when, above all, the quantity of urine is not augmented, (and this fact has been put in clear light by Jaccoud and Bucquoy), be persuaded that there is a fatty degeneration of the heart, and immediately cease the employ of the remedy.

You remember the male patient that occupied No. 5, ward St. Charles. He entered with all the signs of a cardiac affection, a voluminous heart, intense dyspnœa, manifest œdema of the extremities, urine scanty (scarcely two hundred grammes a day); we gave him digitalis, and despite the utmost care in its administration, obtained no amelioration. The patient died, and the autopsy clearly disclosed the cause

* Revue Medicale de l' Est., 1875.

of the failure of digitalis; the patient presented a fine type of acute aortitis, with almost complete fatty degeneration of the heart muscle.

Examine then, attentively, the action of the pulse, examine the urine, see if it augments by the administration of digitalis; and if you observe neither amelioration on the part of the heart, nor augmentation of the urine, cease the medicine; it is useless, it may be dangerous.

Such, gentlemen, are the principal rules applicable to the employment of digitalis in non-compensated mitral affections. You see that this medicament, like all other therapeutic agents, in order to give good results, needs to be skilfully and judiciously administered; and it is not sufficient merely to know the physiological and therapeutical effects of a medicament in order to possess the indications and contra-indications for its employment, but you must also know what are the most appropriate preparations, the modes of administration and the time most suitable to begin and leave off the treatment.

Digitalis, gentlemen, is not the only heart tonic; there are other medicines which, if they have a less decided action, are none the less sure, to a certain extent, to augment the contractions of the cardiac muscle; I refer especially to convallaria and caffeine.

CONVALLARIA MAJALIS

Although we find casual reference in the old med-

ical writers* to convallaria as a medicament having efficacy in diseases of the heart (5), it is to the Russian physicians that we owe the first scientific data respecting the diuretic and tonic action of this drug on the heart; and I must indicate here, as particularly worthy of mention, the researches carried on under the direction of Botkin, Bojojawlenski, Troitzki, Isiäeff and Kalmikoff. In France it is chiefly since the communication of Germain Sée in the *Bulletin General de Thérapeutique* (July 30, 1882) that convallaria has entered the domain of therapeutics, and, more recently, Coze of Nancy, and Simon have shown us by sphygmographic tracings the similarity which exists between the action of digitalis and that of convallaria. The lily of the valley, then, is a diuretic medicament by its tonic action on the heart, whose muscular contractions it enforces, and whose beatings it regulates. Nevertheless its action is uncertain, and the results which I have obtained confirm entirely the judgment pronounced by Stiller in Germany, Constantin Paul, Peter, and Humbert Molliere in France. This drug, however, seems to be perfectly safe, and deserves to keep its place as an adjuvant, and when you make use of it you can employ the preparation prescribed by Langlebert, or instead of that, the following formula:

*Malthiolus, 1580, Cartheuser, 1745, Ferrein, 1771.

Take of Extract of the flowers and leaves of
Convallaria majalis, 7 parts,
Syrup of orange peel, 120 parts,
Syrup of the five roots* 150 parts.

You will give of this preparation a tablespoonful morning, noon and night, (6).

A better form for the administration of convallaria would be the following:

℞ Fluid Extract Convallaria, ʒ ii,
Syrup Aurantii Cort. ℥ i,
Infus. Scoparii, ℥ v.
M. Sig. A tablespoonful three times a day.—Trans.

It has of late been proposed to substitute for convallaria, one of the glucosides found in 1858 by Walz, convallamarin. Although Ernest Hardy and Tanret have given us the means of obtaining this glucoside in a state of purity, and notwithstanding the experiments of Marmé, in 1867, which have shown us the identity of action of convallaria and convallamarin, this glucoside has not yet entered the domain of medical practice, and the trials have been too few in number to allow us to judge of its medicinal worth. Till, then, further trials of this glucoside have been made, we shall do better to stick to the solid or fluid extracts, made of the flowers and the leaves.

*The syrup of five roots might be replaced in American practice by the officinal *Syrup Althaea.*

If convallaria and convallamarin are uncertain diuretics, it is not so with

CAFFEINE,

which renders us important service, almost equal to that of digitalis in affections of the heart. It is above all in the last stage of the malady, in the asystolic period, and when the other heart tonics have lost their effect, that caffeine will render you the most signal service. I shall not here take up your time with details of the physiological action of caffeine on the circulation.(') When you take a general view of all which has been written concerning the effects of coffee and caffeine, you find that the theories which have been put forth on this subject may be arranged in three distinct groups: Some, as Gentilhomme of Rheims, maintain that caffeine has no action on the heart. Others, as Trousseau, Rognetta, Penilleau, Deltel, Sabarthez, claim that it accelerates the beatings of the heart, others, still, as Caron, Méplain, and Fonssagrives, believe that it slows the heart.

Whence come these differences of opinion? They are due to this fact, that the toxic effects of the heart tonics are the opposite of the therapeutic, and while caffeine in moderate doses, as the researches of Giraud and Leblond have shown, diminishes the pulsations by augmenting the vascular tension (i e by acting as a cardiac tonic), in higher doses it increases the beatings

of the heart and perturbs them. You easily understand, then, how, and according to the doses employed, exactly opposite results have been obtained. It was in 1839 that an anonymous writer (M. S.) in the Bulletin General de Thérapeutique, called attention to the diuretic action of coffee, and its applications to the treatment of dropsy. Note, however, that in 1825 a Dutch physician had preceded this writer in extolling coffee as a remedy in serous effusions. In 1846, Honoré, physician to the Hotel Dieu, signalized the favorable effects which he had obtained from the infusion of coffee in albuminuria and dropsy.

But it was in 1863 that the first important work appeared on the therapeutic action of caffeine in diseases of the heart; this was the production of Koschlakoff, an assistant of Botkin, of St. Petersburgh. In 1866 Jaccoud introduced caffeine into this country as a remedy for diseases of the heart, and in 1877 Gubler spoke of it as the ideal diuretic. Nevertheless, despite a very important practical treatise of Brakenbridge pointing out the necessity of large doses, caffeine was administered thus far in but feeble doses, scarcely 50 centigrammes a day.

The trials simultaneously made at Lyons by Lepine, and in Paris by Huchard, showed that these doses were insufficient, and that one should not hesitate to give two grammes (3 ss) a day of this medicament in order to obtain its desired effects. This is the rule which you ought to follow, and when you prescribe

caffeine, you will do well to make use of one of the most stable preparations of this alkaloid (*), which consists of its combination with benzoate of soda, according to Tanret's formula:

Take of Caffeine, 7 grammes (gr. cv).
Benzoate of soda, 7 grammes (gr. cv).
Water, 250 grammes (f ℥ viij and 3 ijss).

M.

Dose, a tablespoonful three times a day; each dose contains 50 centigrammes (7½ grs.)of caffeine.

I discard as untrustworthy the preparations of caffeine under pill form or in capsules. The capsules, in fact, often determine severe pains in the stomach, and sometimes vomiting.

When you cannot administer caffeine by mouth, you may make use of the hypodermic method, in which event the following solution will be found convenient:

℞ Benzoate of sodium, 3 grammes (gr. xlv).
Caffeine, 2 grammes (3 ss).
Distilled water, 6 grammes (f 3 jss).

M.

Each cubic centimetre (syringeful) contains 25 centigrammes of caffeine (about 5 grains.)

Whenever, then, you have a patient in the last stages of heart disease, where everything has been tried and everything has failed, you may resort with confidence to caffeine, and administer it in the dose of 20 to 30 grains a day, and you will often obtain effects truly marvelous.

The necessity under which we find ourselves of giving pretty large doses of caffeine, has caused coffee and its infusion to occupy but a secondary place in cardiac therapeutics, and hence coffee comes in only as an adjuvant medicine, under the form of ptisan. By this, roasted coffee is meant; certain authorities have vaunted the properties of green coffee, not only as a remedy for gout and its manifestations, but also for hypertrophy of the heart. Pelletan, who was much in the habit of prescribing this medicine, gave these directions: Take twenty of the berries; bruise and pour on them a cupful of boiling water; this is to be rejected; then pour over them another cupful, in which they are to be allowed to macerate, and the whole is to be drank by the patient.

KOLA.

I have for some time experimented with a vegetable substance much in vogue with the tribes of Central Africa, I allude to Kola.(*) Kola nuts contain, as the painstaking researches of Heckel and Schlagdenhaufen show, a considerable quantity of caffeine and a little theobromine; we administer it roasted and in the form of infusion, like coffee, or in the form of tincture, alcoholature and elixir. Thus far the effects obtained are very inferior to those of caffeine, and if kola seems to be a powerful tonic of the heart, it possesses nevertheless feeble diuretic power.

BROMIDE OF POTASSIUM.

I have in the previous lecture alluded to the advantages which the physician may derive from bromide of potassium in alleviating the distress and nervous perturbations of diseases of the heart in their incipiency. In uncompensated mitral affections a different action is sought, the bromide acts directly on the heart and circulation, and, in the opinion of certain therapeutists, such as Binz and Sée, this is the dominant action of bromide, which they class, not among nervines, but among the cardio-vascular medicaments.

In fact, bromide of potassium has for its action to regulate the circulation, and if to this we add its sedative properties on the cerebro-spinal axis, and in particular on the bulbus, you will understand the great service which it may render in the affections of the heart, and particularly in mitral affections.

All observers who have studied the action of bromide on the circulation, if they do not agree in their explanation of the cause of the effects of this medicine, yet admit that it has an undoubted influence in lessening and regulating the circulation. Thus Gubler has observed that in individuals affected with organic disease of the heart, bromide of potassium has a very marked sedative action, and not only causes intermittences to disappear, but may also bring down the pulsations from 118 to 78 per minute. Laborde, Eulenburg and Guttmann have shown its paralyzing action on the heart. Martin Damourrette and Pelvet have maintained, on the contrary, that bromide of potassium is a nervo-muscular agent, and not a poison of the heart (Bulletin de Thérapeutique, 1867). Peltzer has seen the

energy of the heart decline, and the frequency of the pulse descend to 50 per minute. Peyraud has shown, in a work of his, that a concentrated solution of this salt, applied to the skin, arrests the local circulation; hence he has advised to apply it locally to stop hæmorrhages. Geneuil has put this method in practice successfully in certain cases of epistaxis. G. Sée has remarked that if you inject into the aorta a solution of bromide of potassium, you note a diminution of the pulse; he attributes its action on the cord to the anæmia which it produces in this nervous centre; the vaso-constrictive action of bromide is thus demonstrated.

Far superior to opium, which can but augment the congestion, already so pronounced, in the encephalon, the bromide will procure calm and repose, it will regulate the beatings of the heart, will diminish the nervous irritation so frequent in cardiac patients, and may thus combat the fatiguing insomnia which exhausts the patient.

I have already indicated the manner of administering this medicament, and in what dose you should give it. I shall not repeat what I have said, only adding that generally from 15 to 30 grains suffice to procure sleep and quiet.

STRYCHNINE.

There remains lastly strychnine, whose special action on the muscles of the economy you well know. I shall take up this point more especially when I come to the spinal paralyses. The attempt has been made to utilize in the treatment of diseases of the heart the

convulsivant and tetanizing properties of this medicament, and Muller has made on frogs experiments which prove that strychnine, like digitalis, produces diminutions in the beatings of the heart, while augmenting the muscular contractions of that organ.

This medicament has been given with good effects to cardiac patients. I may, for instance allude to the results of the practice of my friend and colleague, Desnos, who prescribes the powder of nux vomica in the dosé of five to 10 centigrammes, (¾ to 2 grs.) and has in some cases observed therefrom a great amelioration in affections of the heart. The bitterness of this powder, it is true, renders its administration somewhat difficult, but you can with advantage make use of an excellent preparation of strychnine, the bitter drops of Baumé, of which you may give 5 or 6 drops, and even more. There are also other good preparations which you may employ: The liquor strychniæ (dose 5 drops); the extract of nux-vomica (dose ¼ of grain); the officinal tincture of nux vomica (dose 5 drops), etc.

Such, gentlemen, are the principal tonics of the heart. Often, to obtain well marked effects in patients who have a mitral affection, you will be obliged to have recourse to all these tonics, which you will employ, not together, but in the following way: I told you, when speaking of digitalis, how important it is to suspend the medicine during several days; well, then, during this interruption, you can use bromide of

potassium, convallaria, caffeine, and even strychnine. Formulate the treatment, for example, as follows: During four days the maceration of digitalis (25 centigrammes of the powdered leaves per day), and if it is necesssary to obtain a very prompt and decided effect, employ the method of decreasing doses, commencing with 50 centigrammes the first day, and gradually tapering off to 10 centigrammes per day of the powdered digitalis in maceration.

Then let your patient rest four days, and to continue the tonic effects of digitalis, use bromide or convallaria, and thus keep on with periods of four days of treatment, and four days of rest. Keep caffeine in reserve for the more grave cases, and when the other heart tonics have failed, it is a reserve force which will give you, as I have told you, marvellous results.

I shall not speak of quinine ([10]) nor of ergot of rye,([11]) which have been considered as heart tonics, but which act on the entire circulatory system, rather than on the heart itself.

I have given you, gentlemen, the therapeutic rules which should direct the administration of the tonics of the heart, but this is but one part of the treatment, though a very important part it is true. In the next lecture you will see that the physician possesses still other precious remedies with which to combat the numerous symptoms which arise. I allude to diuretics purgatives, and sudorifics.

NOTES.

1. HISTOLOGY OF THE HEART.—The heart is composed of two muscular bags enclosed in a third, also muscular. (Winslow).

The proper fibres of the ventricles, according to Senac, have a spiroidal arrangement. According to Gerdy, all these fibres form loops whose extremities are attached to the auriculo-ventricular orifice, and they embrace each other like French horns of unequal dimensions, the smallest of which is regularly encased in the largest. There are also certain connective fibres "unitive fibres" common to both ventricles. These go from one fibrous zone to another, often first running down to the apex then back to the opposite fibrous zone; and forming thus angles of reflection in which are lodged the horns formed by the *fibræ propriæ*. * * * * As for the fibres of the auricles, they form multiple fasciculi which surround the large orifices, and embrace the venæ cavæ as in a sling. * * * Many of these fasciculi intercross each other like a network. The fibres proper of the left auricle form an uninterrupted layer in which we remark (1,) a band which circumscribes the left auriculo-ventricular opening; (2,) another which separates the auricle from the left pulmonary veins; (3,) a sphincter for each of the pulmonary veins etc. * * *

Structure.—The structure of the cardiac fibres is very interesting. They are striated fibres of a particular order, unlike the muscular fibres of organic life, which are arranged in gradually increasing bundles, they are united the one to the other, divide and subdivide, and anastomose, as we see in the striated fibres of no other muscle. Their volume is less than that of the ordinary striated muscular fibres. The ordinary striated fibre is formed of a single cell, while the cardiac fibre is constituted by the union of cells connected by cellular tissue, which when stained with nitrate of silver, present themselves to the microscope under the form of irregular lines (scalariform

lines of Eberth). The cardiac muscular fibres have no sarcolemma. The transverse striæ are nearer together than is the case with the voluntary muscles.

Vessels.—The nutrient arteries come from the coronary. They divide into capillaries which form meshes enclosing three or four fibres at once. The veins follow the course of the arteries. As for the lymphatics, they are so numerous, and form so rich a network throughout the heart's substance that the heart might well be compared to a lymphatic sponge.

Nerves.—The *afferent* nerves furnished by the vagus, are divided into cervical branches and thoracic branches. The *cervical* branches are the first, second and third cardiac nerves, which anastomose with branches from the carotid plexus of the sympathetic and with branches of the inferior laryngeal. The *thoracic* branches are much more numerous on the left side than on the right, shorter than the other branches of the pneumogastric, anastomose with the cardiac filaments of the recurrent, and with branches of the great sympathetic.

The pneumogastric furnishes still other branches, but indirectly by the medium of the recurrent; these are the middle cardiac nerves of Hirschfield, which anastomosing with the superior cardiac nerves of the vagus and branches of the sympathetic, form a small plexus before losing themselves in the cardiac plexus.

The branches from the great sympathetic, rudimentary on the right, much more pronounced on the left, are the superior, middle, and inferior cardiac nerves, which spring from the cervical ganglia of the same name, and the first thoracic ganglion. They anastomose with each other and with the laryngeal plexus, the cardiac branches of the recurrent, and the cardiac thoracic branches of the vagus.

Besides these nerve fibres anatomically visible, physiology has acquainted us with: *centripetal* branches, among which is the *depressor* nerve of Cyon; centrifugal nerves, among which

is the accelerator nerve of Cyon; lastly, other accelerator fibres from the spinal cord, and destined for the loop of Vieussens, (double nerve branch joining the last cervical ganglion to the "star" ganglion, first thoracic ganglion,) which Bezold and Cyon think is the centre of the accelerator nerves.

Plexuses.—These are divided into three planes: an anterior, which follows the left coronary artery and innervates that vessel, the pulmonary artery, the aorta, the right auricle, the pericardium, and is continued up ward to the brachio-cephalic trunk on the right side, to the subclavian and carotid on the left; this plane presents to view *the thyroid ganglion of Andersch*, and the more important ganglion of *Wrisberg;* there is, besides, a middle plane and an inferior plane which is united superiorly to the middle, to the pulmonary plexuses, superior œsophageal, and tracheal.

Efferent branches.—From the cardiac plexus spring two secondary plexuses: *the anterior or left cardiac plexus*, furnished by the superficial plane, follows the anterior coronary artery and divides into two parts, one of which follows the auriculo-ventricular fissure, giving superior branches to the auricles and inferior to the ventricles, and the other follows the anterior interventricular fissure, giving nerve fibres to the ventricles, though more to the right than to the left side. The *posterior*, or *right cardiac plexus*, which follows the posterior coronary artery, is situated first in the auriculo-ventricular fissure, whence it sends upper branches to the auricles, and inferior branches, more numerous on the left side than on the right, to the ventricles; then it is situated in the left interventricular fissure, whence it gives branches to the ventricles. These plexuses innervate, besides the coronary arteries and their divisions, the aorta, the pericardium, and send branches to the pulmonary plexuses.

Ganglia and Terminations.—The nerves of the heart present in their course microscopic ganglia, which in certain points

unite to form larger ganglia, which have been, at least, clearly demonstrated in animals. They are three in number: Bidder's ganglion near the mitral valve; Ludwig's ganglion in the inter-auricular septum, and the ganglion of Remak, at the mouth of the vena cava. The connections of these ganglia with the nerve fibres are not well understood. According to Kolliker, they have no connections except with the fibres of the sympathetic, while Beale thinks that they have to do only with the fibres of the vagus. * * * *

The terminations of the cardiac nerves are known only in animals. According to Kolliker, they terminate by free extremities; according to Krauss, by motor plates; according to Ranvier, by an intra-fascicular net-work; according to Tescher, by an extra-fascicular net-work.

2. DIGITALIS.

Digitalis, employed first as an emeto-cathartic, did not have a place in therapeutics till by the labors of Withering and Cullen its effects on retardation of the pulse and diuresis were demonstrated. Withering began to prescribe it in the hospital of Birmingham in 1775, and presented in 1779 to the Society of Medicine of Edinburgh a study based on 163 personal experiments; then Cullen, a friend of Withering, confirmed these experiments. It was not, however, till 1785 that the great work of Withering appeared, entitled "An account of the Foxglove." He employed the leaves of digitalis in powder, in pills and in infusion. From this epoch, date the researches on the physiological action of this medicament.

Among the observers who have devoted themselves to this study, there are many differences of opinion, which, however, are all explicable by this fact, that all did not put themselves in the same experimental conditions, or make use of an identical medicinal preparation.

Experiments on animals have shown that digitaline,

which Claude Bernard ranks among the poisons of the heart, has a special action on that organ. A powerfully toxic dose speedily destroys an animal; the beatings of the heart are annihilated, but sensibility, motility, and respiration persist for a variable time. According to Sée, the heart is arrested in systole in cold-blooded, and in diastole in warm blooded animals. Bouchardat and Sandras have seen that in dogs death may take place by the injection of one centigramme of digitaline into the veins. The extinction of the vitality of the heart is explained, according to Traube, by the action of digitals on the regulator nerves; according to Stannius, on the musculomotor nerves.

Applied to the denuded derm, digitalis provokes a keen and painful inflammation; hence, in man it ought not to be employed in hypodermic injections except in very exceptional cases.

In the estimation of some authorities, digitalis is a regulator and retarder of the circulation, (Withering, Cullen, Beddoes, Kinglade, Crawford, etc.) According to others, it is a regulator and accelerator of the circulation (Joerg, Sanders, Hutchinson).

According to Professor Sée, digitalis slows the heart by exciting the moderator nerves, and especially the cardiac inhibitory ganglion; if you cut the vagi nerves, the action of digitalis is not produced, and the slowing does not take place.

According to Guido Cavazzini, digitalis has but little action on the auricles, while augmenting the tone of the ventricles, and its action on the blood-vessels is secondary; in toxic doses it produces tetanus of the heart and rupture.

As a matter of fact, according to the most recent researches, it appears that in moderate doses the pulsations are slowed, the pulse augments in force, in fulness, and regularity. The augmentation of vascular tension is well shown, moreover,

by the sphygmographic tracings of Chauveau, Marey, Siredey, Legroux, and Gubler, and by Briquet's hæmodynamometer.

It is also proved that the maximum of action of digitalis (on condition, however, that the medicine has been given for some time) is observed after leaving off its administration, and that the calmative effect on the circulation makes itself felt for nearly a whole week afterwards.

According to some authorities (Bouillaud, Gubler and others), one should obtain at first a more or less marked slowing of the pulse; other observers, however (Hirtz, C. Paul, etc.). affirm an acceleration at the onset. Digitaline in centigram subcutaneous injections in frogs first accelerates, then in a few minutes slows the heart; the ventricles first cease to beat, then the auricular contraction is arrested.

In doses too long continued there is accumulation of effects; the pulse becomes slow, irregular and intermittent, and the phenomena of poisoning appear. There is a sort of paralysis of the entire circulation, consequent upon exhaustion of the heart muscle under the prolonged stimulus of the medicine. (Gubler, Reynal, Bouley).

Summing up the action of digitalis on the heart, Gubler says: Digitalis is not an enfeebler of the central circulation, it is rather the regulator and fortifier of the heart; less the *opium* than the *quinine* of that organ.

Respiration.—In therapeutic doses the respiration is little influenced; in large (toxic) doses it is accelerated.

Temperature. — Dumeril, Demarquay and Lecointe say that digitalis raises the temperature one to two degrees (experiments on dogs). Traube, Hirtz, Coblentz, Wunderlich, Oulmont, Gubler, etc., say, on the other hand, that in moderate doses it lowers the febrile temperature and diminishes vascular congestions.

Nerve Centres.—In small doses there is little effect; sometimes some heaviness of the head; in excessive doses, cephal-

algia, vertigo, pains along the spinal column, muscular enfeeblement, prostration, buzzings in the ears, hallucinations, delirium (Bouillaud, Andral, Durozier); ocular troubles, mydriasis (Stannius, Hervieux), diminution of the contractility of the iris (Homolle and Quevenne). In animals in toxic doses, stupor, insensibility, coma; the gait is staggering, and there is general muscular prostration (Bouley and Raynal).

Genital Organs.—Digitalis seems to have a sedative and enfeebling action on the genital organs. It has been given in doses of 5 or 6 grains of the powder in nocturnal pollutions and spermatorrhœa (Corvisart, Laroche, Bouchardat, Legroux). According to Germain Sée, digitalis combined with iodide of potassium is the best means of treating libidinous patients in whom the *hour bell of frigidity has sounded before that of resignation.*

It acts also on the uterus, whose contractions it excites (Piednagel); it has been advised along with ergot to stimulate the uterus (Dickinson, Delpech); it has been employed as an abortifacient (Tardieu). Its action on the kidneys is most marked. (See Vol. II., Leçons de Clinique Thérapeutique, Chapter on Diuretics).

Digestive Tube.—In small doses, digitalis or its alkaloid may provoke some nausea, loss of appetite, and a feeling of heaviness in the stomach. In large doses it violently irritates the gastro-intestinal mucous membrane, causes nausea, vomitings sometimes incoercible, and often diarrhœa. It will not do to forget that formerly this medicament was used as an emeto-cathartic, and that in contact with the mucous membrane it may cause ulcerations (experiments on animals). The action of digitalis on the different glands of the economy is little known, and is obscure. Some authorities regard it as having an action on the salivary glands, sweat glands, etc., and Jæger Schmitz says that he has seen erythematous patches follow its use.

3. ALKALOIDS OF DIGITALIS.

It was not till after the first researches of Pelleteir and Caventou (1816-1820) on the organic alkaloids that the active principle of digitalis was sought for, and despite the labors of Pauquy (in 1824), Leroyer (in 1824), Dulong, Watson, Welding (1834), Rollier (1834), Lancelot (1834), Morel (1844), Walz (1846-1858), Kossman (1845-46), Homolle and Quevenne (1845), Nativelle (1872), Schmiedeberg (1874), Baudrimont (1877), this principle is not yet clearly defined; that is to say, chemists are not yet settled as to its elementary and chemical composition, and it is quite probable that still other digitalines may be discovered. Besides the alkaloid, the following principles are found in digitalis; digitalose, digitaline, digitalide, digitalic acid, tannic acid, starch, sugar, pectine, an albuminoid matter, an orange red crystallizable matter, chlorophyl, volatile oil, salts, etc.

Schmiedeberg, on studying the seeds and leaves of digitalis, has distinguished four principal bodies; 1, digitosine, an amorphous body, whose derivatives are digitoresin and para-digitogenine; 2, digitaline; 3, digitaleine; 4, digitoine.

Waltz (1846-1858) has extracted an amorphous substance, digitalosin, soluble in alcohol, little soluble in cold water, a little more so in warm water, which is decomposed by dilute acids into digitaliresin, para-digitalesin and sugar.

Marmé has extracted inosite from the leaves of digitalis, and Baudrimont has recently found methylamine. In this connection it is worthy of remark that amylamine and methylamine have a notable action on the circulation (Dujardin Beaumetz). The digitalines most known are; 1, amorphous French digitaline (of Homolle and Quevenne); 2, Crystallized digitaline (Nativelle's digitaline); 3, the German digitaline (of Kosmann and Merk).

The digitaline of Homolle and Quevenne is a white amorphous powder, of resinous appearance, inodorous, of excessive

bitterness, little soluble in cold and rather more so in warm water, soluble in all proportions in alcohol and chloroform, and scarcely at all in ether. Hydrochloric acid turns it emerald green, while sulphuric acid gives it a red hyacinth color, and nitric acid turns it yellow. This digitaline is furnished by the leaves of the plant, while the German digitaline is extracted from the seeds.

The digitaline of Nativelle presents itself in masses of crystalline appearance, and possesses the same chemical reactions as that of Homolle and Quevenne. By anhydrous chloral, which dissolves it, it takes on a rosy red, then vinous, then deep green hue. More powerful than the amorphous digitaline, this alkaloid ought to be managed with very great care. Gubler has seen it in milligramme and a half doses, taken thrice in the twenty four hours, give rise to symptoms of intolerance and to toxic phenomena, which have lasted a week.

Roucher has found a digitaline as it were intermediate between amorphous and crystalline digitaline. This new product, called globular digitaline, still little known, resembles the body discovered by Homolle and Quevenne. The German digitaline of Kosmann and Merck, soluble in water, turns green by hydrchloric acid, is colored deep brown by gaseous hydrochloric acid, and is less active than the amorphous digitaline.

The crystallized digitaline is without action on polarized light, while the amorphous digitaline possesses a rotatory power.

4. BOTANICAL.

Besides the digitalis purpurea, with which alone we are now concerned, the genus digitalis comprehends the following varieties: *Digitalis lutea* (Linn.), *digitalis grandiflora* (Lam.), *digitalis purpurescens* (Roth.), digitalis epiglottis (Scannag).

Digitalis purpurea.—Fuchsius was the first to give to this plant the name of digitalis, and to state its true characters.

The foxglove is a herbaceous biennial plant. It grows on dry, sandy, elevated land; is found by the roadside; is wanting in clayey soil; is found in the suburbs of Paris, in Normandy, in Bretagne, in Picardy, in Germany, in Switzerland, etc. (In the United States it is cultivated for ornament and for medicinal use.)

Description.—The first year its fusiform, fibrous root sends forth large tufted leaves; the next summer, a single erect downy and leafy stem, two to five feet high and ending in a beautiful spike of purple flowers. The lower leaves are ovate, pointed, and stand on short winged footstalks; the upper are alternate, sparse and lanceolate; both are obtusely serrate and have wrinkled velvety surfaces, of which the upper is a fine deep green, the under, pale and more downy. Flowers numerous and attached to upper part of stem by short peduncles, in such a manner as generally to hang down on one side; with bracts at the base. Calyx, of five segments, of which the uppermost is the narrowest. Corolla monopetalous, campanulate with short-margined obtuse lobes, in shape and size resembling the finger of a glove, whence the name *foxglove.* Externally of a bright purple color, internally it is sprinkled with black spots on a white ground. There are four didynamous stamens, shorter than the corolla; anthers are in pairs; styles simple, with bifid stigma; seeds are numerous, very small, and contained in a pyramidal two celled capsule; the parts used in medicine are the seeds and the leaves.

The leaves are the parts generally employed. Much care is necessary in their selection and preservation. They should be gathered in the second year, the leaves of the first year being excluded, and a little before the period of inflorescence. Hepp, a pharmacist of Strasburg, who makes a specialty of furnishing digitalis for the markets, recommends

never to use leaves which have been kept more than one year, as the foxglove deteriorates by time. The leaves are first dried in the shade, then desiccation is completed in a stove whose temperature does not exceed 104° F. The leaf stalk and midrib are rejected, and only the full grown and fresh leaves are taken. The leaves thus selected and dried, are kept in tin canisters and glass jars away from light and moisture, and they may be pulverized as required. Much of the digitalis in American markets is obtained from the Shakers, and is in oblong compact masses, into which the leaves have been compressed. The quality of these cakes is generally good, but according to Wood (U. S. Disp:), they will sometimes be found mouldy in the interior. As for the quantity of active principle contained in the dried leaves, Hepp estimates it at 5 grammes of digitaline per 1000 grammes of the leaves, while from the same quantity Henry has obtained from 9 to 10 parts of the alkaloid.

5. CONVALLARIA.

Matthiolus in 1759 (Commentaries of Dioscorides) affirmed that the Lily of the valley was a strengthener of the heart, and that it was good for epileptics and paralytics who have palpitations. Cartheuser, in 1745, among the numerous properties which he ascribes to convallaria, says it is good in heart affections, and allays palpitations. Ferrein, in 1770, called attention to the diuretic properties of convallaria. All these facts were almost forgotten, when the Russian physi cians, under the direction of Botkin, again took up the study of the physiological action of this medicament, and then successively appeared the publications of Bojojawlelenski, of Troitski, of Isaieff, and Kalmkoff, which pointed out its tonic action on the heart. In 1882, Germain Sée communicated to the Academy of Medicine the results of his experiments. Coze, of Nancy, and Simon, have more recently completed these researches. These are the results at which the different

experimenters have arrived: Troitzki and Bojojawlelenski, under the direction of Botkin, of St. Petersburgh, have studied the physiological action of convallaria. They have shown that in the frog, as in warm blooded animals, under the influence of this medicament, there is diminution in the number of contractions of the heart, and increase in the arterial pressure. They also noted in man a very marked diuretic action. Dr. Ary has observed the same tonic action on the heart, and the diuretic effects of convallaria Moreover, he considers it as a sedative of the nervous system, and, like Botkin, has employed it in the treatment of certain neuralgias.

Germain Sée has repeated all these experiments, both on man and on animals.

In the frog, one drop of the extract of convallaria placed directly in contact with the heart arrests this organ in systole. In the dog, it suffices to inject into a vein four drops of the extract to determine in 10 minutes death by arrest of the heart. In man, the extract of convallaria seems to stop arythmia of the heart even when dependent on the lesions of the orifice. It also acts with extreme rapidity in palpitations, lessening the frequency of the heart's action, but less energetically than digitalis. It notably augments the vascular pressure and the energy of the heart muscle. Lastly, it favorably influences respiration and calms dyspnœa. The diuretic effects of convallaria, according to Sée, surpass those of any other cardiac medicine, not excepting digitalis. Hence, convallaria would seem to be indicated in all cardiac affections with anasarca. It has no injurious action on the digestive tube.

Coze and Simon have shown by experiments on cold-blooded animals, the frog and the turtle, that convallaria slows the pulse, still at the same time increasing its fulness, and they have given the name of *useful period* to this phase of the action of the medicament. In comparing digitalis with convallaria, they have found that the duration of the *usefnl period*

is almost the same for convallaria as for digitalis; at the same time, the augmentation in the amplitude of the pulse was always greater in the case of convallaria than of digitalis. This cardiac and diuretic action of convallaria has not been admitted by all observers; thus, Stiller in twenty cases of cardiac affections has obtained positive results in only two. C. Paul and Peter in France consider it as having a very uncertain diuretic action. Soulier, Aubert, Icard and Humbert Molliere regard convallaria as but a very moderate diuretic.

6. The convallaria majalis (lily of the valley, *muguet*) is a perennial plant which grows wild in certain parts of Europe and the U. S.

Stanislaus Martin analyzed convallaria in 1865; he there found an alkaloid to which he gave the name *maialine*, an acid, maialic acid, an essential oil, a yellow coloring principle, wax, mucilage, an active extract, and vegetable fibre.

Previously, in 1858, Walz had extracted from the lily of the valley two glucosides; convallamarin and convallarin.

In 1867 Marmi experimented with these two glucosides and determined their active properties. Convallarin he found to be purgative, and not toxic, while convallamarin acted on the heart, and produced death in the dog in the dose of 15 to 30 milligrammes.

Ernest Hardy has repeated these researches, and has isolated convallamarin by following out the process of Dragendorf. Tanret has perfected the method of extraction of convallamarin, and obtained a product having the aspect of ordinary amorphous digitaline.

Adolphe Langlebert has studied the different modes of preparation, and having discovered that the alkaloids and tinctures have little action, he has advised the watery extracts prepared with the flowers and stems, to which is added a third part of their weight of the roots and leaves. This extract, deprived in part of its resinous and purgative principles, is of

solid consistency, of bright black color, of bitter savor, and of agreeable and persistent taste; it serves for the preparation of a syrup which contains, per dessert-spoonful, 50 centigrams of the extract.

7. CAFFEINE.

Leblond thus sums up the views of physiologists respecting the action of caffeine on the heart and circulation:

Londe, Nysten, Murray, A. Richard, etc. affirm that coffee excites the action of the heart. According to Prompt, it accelerates the pulse.

According to Trousseau, infusion of coffee increases the beatings of the heart.

Rognetta says that the pulse is not quickened under the influence of coffee, or if it be quickened, this is due simply to the fact of taking a hot drink. The pulse, he says, becomes slower, fuller and softer, indicating a depressant effect on the circulatory vessels; he adds, moreover, that coffee has an elective action on the vessels of the brain, which it tends to deplete.

The tetanic state provoked by caffeine, says Albert, does not limit itself to the external parts, to the peripheral muscles, but invades the heart as well, for as soon as the contractions manifest themselves in the members, the heart is spasmodically affected, labors, and becomes sensibly smaller. It is in this way that caffeine differs from the powerfully toxic narcotics; with whatever violence and rapidity (for example) nicotine may act on the heart of an animal, this organ preserves the regularity of its movements an hour and even more after the appearance of the paralysis or spasmodic contraction of the members, which is not the case with caffeine, whose action as before stated, when given in toxic doses is unique Peniileau and Deltel call coffee an acelerator of the heart.

Caron, who, in an experiment on himself, took 7½ grains of caffeine in one dose after breakfast, experienced at the end of two hours: first a general prostration of the forces, a vague

headache with trembling of the limbs, which staggered and could hardly support the body; later still, a strange sense of nausea, a fullness of the stomach, continual somnolence, with prolonged want of appetite; and he remained until 11 o'clock at night without desire for food. His pulse gradually fell from 80 to 56 beats per minute. Meplain, after having ingested 50 centigrammes of caffeine, also found his pulse to fall from 51 to 56 beats. According to Jomand, the action of caffeine on the heart is one of slowing; Sabartherz, on the other hand, has recently noted that the infusion of coffee produces an acceleration of the cardiac contractions, whether taken cold or hot, on an empty stomach, or after a full meal.

"It is necessary to bear in mind," says M. Leven, "that in toxic dose caffeine always begins by augmenting the number of heart beats; it is not till the second phase of its action that it slows them." Voit, Stuhlman, and Falk have arrived at the same conclusions.

According to Binz, caffeine in moderate doses increases the action of the heart by directly stimulating this organ, and exciting the arterial contractility. The blood pressure and the frequency of the pulse are augmented; the temperature also rises one degree or more, and more urea and CO^2 are eliminated than in the normal state. All the symptoms are of relatively short duration, for a part of the caffeine is eliminated by the urine almost immediately after its absorption.

Gentilhomme, in his researches, affirms that caffeine is without action on the heart. Hoppe, Schmiedeberg, Johannsen and others fail to notice the action of caffeine on the heart and circulation. Henneguy, on the other hand, has observed that caffeine slows and then enfeebles the movements of the heart, which is arrested in systole.

According to Fonssagrives, caffeine augments the arterial tension, and with it the frequency of the pulse diminishes; there is excitation of the vaso motors, and augmentation of

contractility in the small vessels. The heart is stimulated in a peculiar manner by it, and its movements become more energetic.

Bennet, in his experiments, has always observed contraction, then dilatation of the capillaries, with blood stasis.

The increase of vascular tension had been previously noted by Magendie, who, on injecting 8 grammes of infusion of coffee into the jugular vein of a dog, saw the liquid rise in the hæmadynamometer from 30 to 70.

According to Aubert and Dehn, caffeine in large doses is without action on the heart of the frog, while in the dog and cats there is always seen extreme frequency of the pulse and diminution of the blood pressure, followed by augmentation of tension, with slowing of the pulsations.

Meplain, in his experiments on man, arrives at the conclusion that there is augmentation of arterial tension; sphygmographic tracings obtained upon the right radial have shown him that under the influence of coffee the line of ascent was less vertical and less high; the amplitude of the rebound was much more feeble; the summit of the pulsation was less acute, and even transformed in some cases into a veritable "plateau."

Dr. Giraud, studying on himself the action of infusions of coffee and tea, has come to the following conclusions:

In therapeutic doses, caffeine:

1. Diminishes the frequency of the pulse.

2. Augments the arterial tension as well as the energy of the heart beats.

3. Coffee and tea appear to act only by virtue of the caffeine which they contain.

According to experiments on animals, in toxic doses:

1. It accelerates, then slows the respiration and circulation, by nervous exhaustion.

2. It diminishes considerably the blood pressure.

3. It paralyzes completely the vaso-motors.

According to Stewart, caffeine produces first a stimulant action on the heart, and augments the arterial tension, but consecutively it determines enfeeblement of the cardiac muscular power and diminution of the blood pressure; it acts probably on the cardiac garglia which it paralyzes. In animals poisoned by caffeine the respiration ceases before arrest of the heart.

Leblond has made a great many experiments to ascertain the action of caffeine on the circulation, and these are his conclusions:

In physiological doses:

1. Caffeine is an excitant of the nervous and muscular system.

2. It diminishes the frequency of the pulse by augmenting the energy of the cardiac contractions and the blood pressure through vaso-motor constriction.

3. It lowers the peripheral temperature.

4. It in no way influences the formation and excretion of urea.

In toxic doses:

1. Caffeine increases the excito-motor power of the cord, paralyzes the peripheral sensory nerves, and acts also on the vagus, whose excitability it diminishes.

2. It lowers the blood pressure by paralysis of the vaso-motors.

3. The heart in cold-blooded animals slows more and more, and is arrested in systole; in warm-blooded animals it is quickened at the termination of the toxic scene, and is arrested in diastole.

4. It produces a tetanic action on the muscles.

5. It causes a rapid fall of the temperature.

6. It augments denutrition.

Caffeine has for formula: $C^8 H^{12} N^4 O^2$. It was found in coffee by Rung in 1820. Jobat and Mulder in 1868 showed that theine, which Oudry had extracted from tea in 1827, has

the same composition as caffeine. Guaranine, discovered in 1840 by Martin, is also identical with caffeine; it is the same with mateine, obtained in 1843 from Paraguayan maté. Caffeine crystallizes in fine silky needles, is very bitter, soluble in 80 parts cold water and 60 of gastric juice. It is contained in variable quantities in different kinds of coffee, a quantity which varies from 0.67 to 2.21 per cent. Thus, raw Java has 2.21 per cent., Costa Rica, 1.18, Alexandrine Mocca 0.84; Native Ceylon, 1.57: Surinani, (1st quality) 1.78, etc. In tea it varies from 1.6 to 2. 9 per cent; good black tea (Kiatchi or Canton) containing about 2 per cent., and green tea a little less.

Tanret has shown that the greater part of the supposed salts of caffeine (valerianate, lactate, bromhydrate) do not exist. He has, however, shown that caffeine forms with benzoate, cinnamate, and salicylate of sodium salts very rich in caffeine.

Cinnamate of sodium dissolves caffeine in water equivalent for equivalent: 170 of cinnamate for 244 of caffeine. This double salt contains 58.9 per cent. of caffeine.

The benzoate of soda and caffeine contains for 2 equivalents of benzoate of soda (288) one equivalent of caffeine (244) or 45.8 per cent.

Salicylic acid gives us a soluble salt which is exceedingly rich in caffeine. One equivalent of salicylate of sodium (160) gives solubility to one equivalent of caffeine (244), making the resulting salt the richest of all the double salts in caffeine (61 per cent.).

The solubility of the double salts is such that one may easily obtain with benzoate and cinnamate of sodium solutions containing per cubic centimeter 20 centigrammes of caffeine, and with salicylate of soda, 30 centigrammes.

These are some of Tanret's formulæ:

No. 1. Benzoate of soda, 2.95 grammes.
Caffeine, 2.50 grammess.
Distilled water, 6 grammes, or q. s. to make 10 cubic centimetres.

M.

Each cubic centimetre contains 25 centigrammes of caffeine.

No. 2. Salicylate of soda, 3.10 grammes.
Caffeine, 4 grammes.
Distilled water, 6 grammes, or q. s. to make 10 cubic centimeters.

M.

Each cubic centimeter contains 40 centigrammes of caffeine. Make a warm solution over a sea bath.

No. 3. Cinnamate of soda, 2.10 grammes.
Caffeine, 2.10 grammes.
Distilled water, q. s. to make 10 cubic centimetres.

M.

9. KOLA.

(Sterculia acuminata), of the family of Sterculiaceæ, is a beautiful tree 10 to 20 metres high, which grows in West Africa between Sierra Leona and Congo. Marvellous properties have been attributed to Kola nuts by the inhabitants of Central and Western Africa; it is regarded as tonic and stimulant, and as an aphrodisiac: the nuts are employed in the raw state or dried in the sun and slightly torrified, in the latter case being utilized in the form of infusion.

Heckel and Schlagnenhaufen have studied the chemical and botanical properties of Kola. They have shown that it contains caffeine and theobromine. Caffeine is found in large quantity, 2.349 per cent.; while coffee hardly averages more than 1.50 per cent of this alkaloid.

In a communication made May 30th, 1884, by M. Natton to the Medical Society of the first district, he indicates the different modes of preparation of Kola; these are the formulæ:

TINCTURE OF KOLA.

Take of dried, pulverized Kola, 2 parts.
Alcohol, at 60 degrees, 5 parts.
Mix. Macerate fifteen days.

WINE OF KOLA.

Take of dry Kola in powder, 100 grammes.
Wine, 1 litre.
Mix. Macerate fifteen days.

EXTRACT OF KOLA.

Take of dried pulvertzed Kola, 100 grammes.
Alcohol, at 60 degrees, q. s.
Filter, exhaust by displacement, distill off the alcohol, and concentrate the residue to the consistency required.

SYRUP OF KOLA.

Take of Dried Kola, 100 grammes,
Alcohol at 60 degrees, q. s.

Proceed as in the case of the extract, but instead of distilling off the alcohol, add sugar q. s. to make one kilogramme.

PILLS OF KOLA.

Take of Extract of Kola, 10 centigrammes,
Powder of Kola, q. s.
M. For one pill.

ALCOHOLATURE.

Take of Fresh rasped Kola nuts, 1 part,
Alcohol at 80 degrees, 5 parts.
M. Macerate for 15 days and strain.

ELIXIR.

Take of Alcholature of Kola, 1 part,
Simple Syrup, 1 part.
M. S. A.

SACCHARURE.

Take of Fresh Kola. 1 part,
Sugar, 2 parts.
M. Rub together in a mortar, then pass through a sieve, and dry by a stove heat.

PASTILLES.

Take of Saccharure of Kola, 100 grammes,
Gum tragacanth, 1 gramme,
Distilled water, 6 grammes.
Spts. wintergreen, cinnamon, anise, q. s. to flavor.
F. S. A. pastilles No. C.

10. QUININE.

In his translation of this work, 'Dr Vincenzo Cozzolino indicates quinine as among the best tonics of the heart. He remarks, however, that there are great differences of opinion among physiologists on this point, some believing quinine to be an enfeebler of the heart's action, others a cardiac sedative, and still others a true tonic.

If we refer to physiological experimentation, we shall find that quinine diminishes the arterial pressure, and consequently does not augment the force of the heart. To understand, then, how it is that large doses of this alkaloid have never caused death by paralysis of the heart, we have to admit the theory of a double activity of the organic muscular fibre; a theory proposed by Luciani and defended by Chirone. Accord ing to the experiments of these two physiologists, it appears

that the quinine salts do not act on the intrinsic nervous system of the heart, but rather on the muscular fibre of that organ.

Cozzolino thinks quinine useful in all cases of organic vice of the heart in which there are disorders in the peripheral circulation.

Prof. Semmola advises to employ a decoction of cinchona rather than the salts of quinine in cases of cardiac adynamia.

From the sum of experiments and observations we may conclude that quinine in small doses is a reliable and safe agent to sustain the activity of the heart, and that it exercises an important action on the capillaries, whether by a direct excitation of the vaso-motor nerves, or the unstriped muscles.

This same writer mentions the employment by certain Italian clinicians (Moleschoff and Testa) of iodoform in mitral insufficiency without compensatory hypertrophy of the left ventricle. This medicament in the dose of from 5 to 10 centigrammes is said to have been of use in two cases, regulating and reinforcing the action of the heart.

11. Ergot of rye, according to Germain Sée, has the same action as bromide of potassium, being a cardio-vascular medicament; he ranges it among the cardiac medicines that excite the vaso motor centres. Massini has, moreover, used ergot in the treatment of organic diseases of the heart.

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CHAPTER III.

ON THE TREATMENT OF DROPSIES DUE TO DISEASES OF THE HEART.

SUMMARY.—Diuretics—Digitalis—Milk—Mineral Waters—Diuretic Ptisans—Nitrate of Potash—Diuretic Wines and Electuaries—Purgatives—Drastic Purgatives—Their Advantages and Disadvantages—Purgative Tinctures, Electuaries, and Pills—Sudorifics—Jaborandi and Pilocarpine—Local Treatment of the Dropsies—Œdema of the Inferior Members—Dangers Therefrom—Punctures with Needles—Incisions—Drainage Tubes—Croton Oil—Effusions into the Pleural Cavities—Indications for Aspiration in These Cases—Ascites—True Cirrhosis Compared with Cardiac Cirrhosis—Indications for Abdominal Paracentesis.

GENTLEMEN:—You know that one of the first symptoms of mechanical disturbances effected in the circulation by non-compensated mitral affections, is the presence of serum in the cellular tissue, and in the different closed cavities of the organism. To combat this œdema and these dropsies, which sometimes take on enormous proportions, the physician has various means at his command: Sometimes he will endeavor to augment the quantity of the urine; sometimes, addressing himself to the digestive tube he will try to remove by this channel the liquid accumulated in the cellular tissue; sometimes, finally, he will utilize the secernant functions of the skin by stimulating the perspiratory glands.

To each of these therapeutic indications corresponds a group of special medicaments: diuretics, purgatives, and sudorifics. We shall study these successively. Let us begin with the diuretics. I shall not here take up the study of the physiological action of this group of medicaments:—I shall state my views on this point when I come to speak of the kidney from a therapeutic standpoint, and I shall then show you how we may subdivide the different diuretic agents. These, as you will see, may all be grouped in four great classes. In the first class are included those medicaments which cause diuresis by augmenting the blood pressure, which they effect by energizing the heart's action, or by acting on the muscular elements of the circulatory system; the second class comprehends medicaments which augment the quantity of the urine by increasing the blood pressure, and by modifying the blood itself; to the third class belong medicaments described under the name *dialyzers*, *i. e.* which modify the blood by introducing saline elements; the fourth class is constituted by medicaments which act by irritating the glandular elements of the kidneys. I can not here enumerate all the medicaments which enter into these different groups. To the first belong digitalis, caffeine, convallaria, ergot of rye, etc.: To the second, water, and most of the diuretic infusions, as well as the greater part of the mineral waters regarded as diuretic, and which act much more by the quantity of water which they represent, than by the saline

substances which they contain; it is in this group we should place milk and wine, particularly white wine. The third group comprehends the dialyzing saline substances;--nitrate of potassium, acetate of potassium, nitrate of sodium, etc. In the fourth group, whose very existence is still contested, and which act by congesting the kidneys, we should place certain resins and balsams.

In dropsies due to disease of the heart, the physician should endeavor to utilize all these diuretic groups, and I will now give you some precise indications as to the medicaments most useful in the treatment of cardiac œdema.

We shall give the foremost place to

DIGITALIS.(1)

I showed you in the foregoing lecture the good effects of this tonic of the heart, and I can only add to what I then said by setting forth its no less great utility as a diuretic agent.

It is here that the maceration of digitalis gives the best results. Suppose, for instance, that you have to treat one of those bad cases of heart disease in which the face is puffed, the limbs swollen, with general œdema and dropsy; the patient is suffering from dyspnœa and so labors for breath that you fear asphyxia imminent;—give this patient the maceration of digitalis and you will witness a marvellous restoration, diuresis will become more abundant, and in a

few days time the anasarca and the effusion in the serous cavities will have disappeared.

You can hardly expect to witness such effects from digitaline, which, as before said, is uncertain as a diuretic.

To prepare the maceration, you will follow the rules laid down in the last lecture. As for the mode of administration, this differs according to different authorities. Some give progressively increasing doses; others continue the dose with which they began; others give the maceration in decreasing doses. The first method is a bad one; the cumulative effects of the medicine tend very rapidly to intolerance. The method of stationary doses enables one, it is true, to prolong the administration of the medicine, but it will be necessary to give very moderate doses, not more, in fact, than 30 centigrammes (gr. v) a day of the powdered leaves; this is Herard's plan. The method of decreasing doses is an excellent way; you thus obtain an immediate effect, sufficiently powerful, without intolerance.

Then come

CONVALLARIA AND CAFFEINE.(2)

If you employ the first, you may give the extract in the dose of from 1 to 2 grammes a day. When you prescribe caffeine, do no forget to order large doses, and do not scruple to give from 1 to 2 grammes a day; and if administration by mouth is impossible, practice

the subcutaneous injections of benzoate of caffeine and of soda. When you give caffeine by mouth, you can make use of the pure caffeine, as Huchard does, or the bromhydrate or citrate of caffeine, according to Gubler's recommendation; or, better still, of the solution of caffeine and benzoate of soda, according to the formula which I gave you in the last lecture.

In the case of children, you can follow the custom of Jules Simon, and combine squills with digitalis. My colleague of the Hospital Des Enfants, often makes use of the tincture of squills, which he gives in the dose of 5 to 10 drops every three hours.

By the side of digitalis and its maceration, I would place milk, as one of the best diuretics. The value of a milk diet in the treatment of dropsies has long been recognized. Christien, of Montpellier, Serres, of Alais, Guinier, and especially Pechollier, of Montpellier, have shown the advantages of the free administration of milk in cardiac affections, and more recently Potain has confirmed the conclusions of these clinical observers. (3.) I need not here dwell upon the rules for the administration of this dietetic remedy, which consist in allowing only milk at stated periods, and foods prepared with milk. I shall give more complete direction on this point when I come to speak of affections of the stomach and of the kidneys. The milk should not be boiled, and its diuretic properties are enhanced by the addition of alkaline waters, such as Vichy,in the dose of a tumblerful to the quart.

Add that milk has here a double therapeutic action: it is not only diuretic, but it tends (as I shall show you) to combat one of the most constant phenomena pertaining to the congestion of the kidney, the albuminuria.

Digitalis, extract of convallaria, and caffeine, on the one hand, milk on the other—these are the principal remedial agents to which you should have recourse. You may add cream of tartar, nitrate of potash, with whose diuretic properties you are acquainted, and, especially, acetate of potash, the happy effects of which Marotte has shown. These salts are generally given with some diuretic infusion, as broom-top or couch grass. But do not forget that if nitrate of potash has diuretic properties which are incontestable, it has also the property of irritating the digestive tube, of provoking diarrhœa and even vomiting, hence you ought in due time to suspend the medicine, or diminish the dose, and never exceed two to four grammes of the salt to each quart of the infusion. I know well that practitioners have given more, but I believe such administration to be without advantage to the patient, without marked action on the quantity of urine excreted, and to be hurtful to the digestive tube.

Thus far I have spoken of the medicament given singly; but often the physician, to obtain a more complete action, will find it more advantageous to associate several of these diuretics in one prescription. Thus you have often seen me give acetate or nitrate

of potash along with vegetable infusions which of themselves have a reputation for facilitating diuresis, such as parietary, scoparium, pareira brava, etc., and there are certain wines, syrups, and oxymels containing several diuretic ingredients combined.

The diuretic wines are in very general use, and one of the best known is that of Trousseau's, which is given in the dose of from half a fluidounce to two fluidounces daily, in divided portions. The formula of Trousseau's diuretic wine is as follows:

Take of Dried digitalis leaves, 10 gms.
Squills, 5 gms.
Juniper berries, 50 gms.
White wine, 750 gms.
M.
Macerate four days, add of acetate of potash, 15 gms.
Filter. Dose, 1 to 2 tablespoonfuls three times a day.

Prof. Gubler has given to the profession an oxymel called the diuretic oxymel of Beaujon, the formula of which is as follows:

Take of Tincture of digitalis,
Watery extract of ergot, ää 10 gms.
Gallic acid, 5 gms.
Bromide of potassium, 30 gms.
Syrup of wild cherry, 100 gms.
Vinegar of squills, 515 gms.
M.
Dose, a tablespoonful three times a day.

Lastly, *the syrup of five roots* (a popular preparation of the French codex) has been happily modified

by Bouchardat, by the introduction of acetate of potash (50 grammes per 1,000 of the syrup).*

You can then vary your treatment to avoid fatiguing the stomachs of your patients and turning them against the medicine, alternating the administration of one remedy by that of another, and then in a little while returning to milk, which increases diuresis, has a calmative local action, and combats irritation of the stomach when provoked by the digitalis or other diuretic agents employed.

Debreyne (Bulletin de Therapeutique, 1843), who has given precious therapeutic formulæ for diseases of the heart, was in the habit of associating digitalis with nitrate of potash in the following way: He prescribed tincture of digitalis in increasing doses, and insisted that the medicine should be faithfully given at stated hours during the day. Thus a dose of the tincture, (and he would generally begin with four drops),was to be given morning, noon and night; this dose was gradually increased till 20 drop-doses were given three times a day (60 drops in the 24 hours). Each dose was taken in a glass of water in which had previously been dissolved twenty grains of nitre.

Such was Debreyne's method. For my part, I advise you if you adopt this way of associating these two diuretic agents, to give the digitalis, not in increasing, but in decreasing doses, beginning with the

* The syrup of five roots contains holly, asparagus, fennel, smallage and parsley.

largest dose and diminishing the number of drops each day till you come down to the smallest dose. It is by following these directions that you will be able to continue the administration of these diuretics longer than you otherwise could.

What effects will you obtain from this kind of treatment? Effects often truly marvellous. In fact, three or four days after the administration of the digitalis, you will see the urine augment, often in remarkable proportions, and the œdema and effusions disappear, as if by magic. Then, when the patient is delivered of his dropsical encumbrance, you will see the quantity of urine return to its normal figure.

Unfortunately, one does not always, it is true, obtain so complete a success; everything, in fact, depends on the state of the kidneys, which, if they are intact, respond energetically to the stimulation of diuretics. Recall to your minds, for instance, a patient who recently entered our wards for general dropsy, associated with a mitral affection. Already in previous years he had been three times admitted to the hospital for the same symptoms by our colleague Mesnet, and each time, under the influence of diuretics, his dropsical swelling disappeared. Again, the treatment has had a happy result, and the patient has left the hospital in a satisfactory condition. But it is not so when the kidney is altered in its structure, or is "smitten with imbecility," to use Gubler's expres-

sion; it no longer responds to diuretics, and the treatment remains inefficacious.

Without stopping to consider other diuretic agents, which have been proposed in affections of the heart, some of which are odd and absurd, like the "blatta orientalis," we will pass on to another group of medicaments, and you will see that, thanks to the tolerance of the digestive tube in cardiac affections, you will find an important adjuvant to combat the dropsies in purgatives.

Just as it was in the case of diuretics, we find purgatives divided into several groups; thus, we have the mild purgatives, such as castor oil and salines, and others called drastics, which determine an enormous secretion from the digestive tube. As in the affections of the heart you desire an energetic and prolonged effect, an out-pouring of serum, in fact, from the whole digestive tube in order to remove the serous effusion in the cellular tissue and great cavities, it is to these drastic purgatives that you should resort.

One of the most vaunted is scammony, which, given in milk in the dose of 50 centigrammes to a gramme, produces abundant stools.* Jalap possesses

* Scammony (Aleppo Scammony) is a gum resin obtained from the *convolvulus scammonia*. The top of the root is cut off just below the origin of the stems, the milky juice which exudes is collected in shells. According to various chemical authorities scammony contains resin, extractive matters, gum, starch, bassorin, gluten, albuminose, cellullose, and salts.

the same properties, and there is a preparation of jalap much in vogue, which may render you service in the treatment of dropsies.† I refer to the *Eau de vie Allemande*, or compound tincture of jalap, which is given in the dose of one or two tablespoonfuls. The cele-

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According to Spirgalis, the resin is identical with that of male jalapin, and it is to this that scammony owes its medicinal properties.

This resin is a powerful drastic purgative given in the dose of 40 to 60 centigrammes in mucilage or in sweetened milk.

Scammony in powder may be given in the dose of 50 centigrammes to two grammes. According to Rayer and Vellemin, scammony in small doses acts better than in large doses.

† Jalap also belongs to the *convolvulaceæ*. The root only is employed; from this a resin is extracted which contains (Buchner and Herberger) jalapin and jalapic acid. Like scammony, Jalap is somewhat uncertain in its action. The root may be given pulverized, in the dose of one, two, or three grammes. The dose of the resin is twenty, fifty or sixty centigrammes.

EAU DE VIE ALLEMANDE.

(Comp. Tincture of Jalap.)

Take of jalap root, 8 parts.
Turpeth root (ipomæa turpethum), 1 part.
Scammony, 2 parts.
Alcohol at 60°, 96 parts.
Mix. Macerate ten days and filter.
Dose, Half a fluidounce to an ounce.

The "purgative medicine of Leroy" contains scammony, turpeth and alcohol, and is a powerful drastic cathartic. [The

brated purgative "medicine Leroy," which was once in so great favor, was nothing but the compound tincture of jalap sweetened with syrup of senna. Guillié has formulated an "evacuant syrup" similar to the tincture of jalap, in which nitre is one of the ingredients. You can also make use of the electuary of Cruveilhier, the good effects of which you have seen in my service.*

Ordinarily I make use of the following mixture, which has always given me excellent results.

℞ Tincture jalap co.,
Syrup of senna,
Syrup of buckthorn, ää gms. xxx (℥ i).
M.
Dose, one to three tablespoonfuls.

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compound tincture of jalap is a preparation much employed, and which might well find a place in the U. S. Ph. Tr.]

* The formula of the electuary of Cruveilhier is as follows:

Take of powdered senna, 4 grammes.
Scammony, 1 gramme.
Gamboge, 0.30 gramme.
Jalap, 4 grammes.
Syrup of buckthorn, 30 grammes.
Honey, 30 grammes.

Mix. Dose, a teaspoonful in the morning on rising.

[A useful preparation of jalap, much in use in the United States, is the compound jalap powder (one part of jalap to two of cream of tartar), of which the dose is one drachm. It is a good hydragogue purge. Of scammony, the official preparations are the *Confection*, the Pil. Colocynth Co., the *Pulvis Scammoniæ Co.*, and the resin.]

Some patients object to taking syrups and electuaries; in such cases you can give purgative pills, such as the Pill Scammoniæ Co., and Trousseau's pills, which are powerful hydragogue cathartics.*

When I spoke of diuretics I showed you that Debreyne was in the habit of combining digitalis with nitrate of potash; he completed the treatment by the administration of two wines; the *vinum major* and the *vinum minor*.†

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*Trousseau's pills:

℞ Ext. colocynth co., 1 gramme.
Ext. rhei, 1 gramme.
Gamboge, 1 gramme.
Ext. Hyos., 0.25 gramme.
Oil of anise, 2.90 grammes.

M.

Divide in pil No. xx.

†DEBREYNE'S VINUM MAJOR.

℞ Jalap, gms. viii.
Scillæ pulv., gms. viii.
Pot. nit., gms. xvi.
White wine, gms. ℔.

Mix. Macerate twenty-four hours and filter.

DEBREYNE'S VINUM MINOR.

℞ Juniper berries, gms. xx.
Nitrate of potash, gms. vi.
White wine, gms. D.

M. Macerate the berries four or five days, filter and express, then add the nitrate of potash and filter.

The dose of these two wines is one or two tablespoonfuls.

Of the *vinum major* he was in the habit of giving morning, noon and night, at first, a tablespoonful, then two, then three tablespoonfuls. As for the *vinum minor* he would give it in larger doses, ordering as much as a wineglassful three times a day.

I have made trials of these wines of Debreyne, and have observed that when taken willingly by patients they give good results, but they rapidly produce an irritation of the digestive tube. This leads me to speak to you of the action of drastic purgatives on the economy.

You must have often been struck by the tolerance of the digestive tube in cardiac patients, who are able for months, and even (it may be) years, to take powerful cathartics without much injury. But along with these facts of observation, it must be confessed that in many cases these purgatives rapidly produce a violent irritation of the whole alimentary canal. These disadvantages were especially apparent, when, during the time of its popularity, physicians were in the habit of giving the "medicine Leroy," and when you make free use of drastic cathartics in your practice you will often witness such untoward results.

In fact, this faith in drastic purgatives is widespread, and when we see nostrum venders vaunt the cleansing and evacuant properties of their drugs, they cater to the popular notion that certain "humors" or secretions are the cause of the diseases, and that in expelling these they cure the disease. This is a pro-

found error; the glairy mucous secretions which are expelled are but the result of inflammation of the digestive tube, provoked by the irritating medicaments.

Whether you practice in the city or in the country, you will see patients with cardiac or other diseases who have been too much dosed with drastic cathartics. You should combat this tendency to overmuch "physicking," and show the danger that attends such treatment; and if, in diseases of the heart, you may often derive benefit from drastics, do not forget to be chary in their employ. Watch, then, the action of the medicament; reduce to a minimum the irritation which it occasions; and when the symptoms of inflammation appear, put one side your hydrogogue cathartics, and resort to other forms of treatment. Remember moreover, that these drastics sometimes determine colicky pains which you must seek to prevent or lessen by a skilful combination of your medicaments.

Diuretics on the one hand, purgatives on the other—such is the therapeutic armor which the physician may use in combating cardiac dropsies.

We have just seen the advantages derivable from medicines which drain off serum from the cellular tissues and great cavities by the kidneys and intestines The skin has also been utilized, and sudorifics have been vaunted in the treatment of cardiac œdema. The external means, such as dry fumigations or vapor baths, should be abandoned, because, while being

limited to twenty or thirty for each limb, and you can also prick the genital organs in several places. It has even been advised, in order to diminish the chances of inflammation, and to keep the openings from closing up, that the point of the needle, before being used, should be heated to a red heat in the flame of a lamp: this is a good precaution and one which in some cases I would recommend.

The great inconvenience attending this method is the incessant flow of serum, which wets and soils the bed-clothes and linen of the patient, and keeps up a constant dampness about the œdematous members. You must, as far as possible, prevent the permanent contact of the exuded serum with the patient's body, and you will attain this result by enveloping the limbs with those rubber wrappings which render so great service in the treatment of diseases of the skin.

Recommend also, especially, that the patient keep in a sitting posture in his bed, or that he be in a semi-reclining posture in an arm-chair. Here in our hospitals we obtain this result by bending the mattress, and thus transforming it into a chair, which allows the legs to hang, permiting a free flow of the serum. In private practice you can use those mechanical reclining chairs which have been so perfected of late, and with which you can obtain all the positions desirable.

You can also evacuate serum by incisions with the lancet or bistoury, but you must not make long ones, which are dangerous, and may be accompanied

by phlegmons, which are more grave from the fact that the distended skin has lost much of its vitality. Moreover, these incisions readily become complicated with sphacelus; often, even after having taken all the necessary precautions and used a very sharp instrument, you may be mortified by seeing gangrenous or erysipelatous inflammation invade the inferior extremities.*

This is one of the most serious objections against this method, which, for this reason, ought to be limited to cases where all other means have failed to rid the patient of his burdensome œdema. However, despite all these disadvantages, I do not hesitate to say that this little operation may give excellent results, and you have seen in our hospital wards, as I myself often saw when I was interne under Dr. Moissenet, astonishing cures effected by this local treatment, joined to an appropriate general treatment. But the favorable action of these punctures is not long continued. In fact, at the end of a certain time, a veritable indura-

* To combat the accidents which may result from punctures of the members, Wilkens proposes the following means: After having well oiled the member, he rapidly makes 20 or 30 punctures with a fine needle, taking care that the points shall penetrate the subcutaneous tissue; then these punctures are covered with sponges which have been wrung out in a solution of salicylic acid; as fast as these sponges fill their contents are squeezed out, and they are again wrung out in the salicylic solution and replaced. This is done every two or three hours. Lancet, Jan. 25, 1879).

tion (sclerema) of the cellular tissue takes place, when even the deepest punctures do not give issue to any serosity.

To avoid the employment of sharp-pointed instruments, another method has been proposed in order to give vent to serum. This method consists in rubbing the lower limbs of the patient with a few drops of croton oil, which gives rise to a crop of vesicles, whose rupture allows serum to escape. Trousseau, who devised this method, has much extolled it. For my part, however, I prefer the punctures. Croton oil, in fact, either determines too active an inflammation, which overpasses its end, or has an uncertain action, by reason of the little vitality of the skin. Moreover, it has not been proved that these little openings in the skin, caused by croton oil, are less liable to inflammation than those made with a needle.*

*Applied to the healthy skin (10 to 40 drops), croton oil produces, after several hours, pain, redness, heat, and swelling. Then after about twenty-four hours ordinarily appear vesicles, whose contents, at first clear and transparent, rapidly become turbid and purulent. On the diseased, skin according to Trousseau, there are two different effects. If the skin in cardiac affections is œdematous but hard, the croton oil application produces but an insignificant eruption. If the skin be distended, smooth, transparent, a copious eruption appears. The vesicles break almost immediately, and occasion an enormous loss of serum. The lesion of continuity which results from the rupture of the vesicles has at first an ugly look, but soon heals.

Trousseau recommends to make this friction only on the

Some little time ago, at one of the Medical Congresses (the Congress of Havre,) Dr. Southey proposed another means of evacuating serum, which consists in the introduction into the cellular tissue of fine drainage cannulas, whose free extremity fits into a rubber tube which communicates with a vessel by the side of the bed. This way of conducting the serosity into an outside receptable, enables one to do away with the great inconvenience which I have before pointed out, namely, the incessant contact of the exudation with the œdematous members. I have not made trial of this mode of treatment, and am not prepared to judge concerning it; I should fear, however, that the presence of a foreign body, such as a capillary trocar in an œdematous and ill-nourished member, would set up considerable inflammation of the tissues. I would therefore advise you, before adopting this method in your practice, to wait for more certain proofs of its harmlessness.

In other circumstances, it is not in the cellular tissue that the serum accumulates, but in the great visceral cavities. In fact, under the influence of

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legs, and to take care that the croton oil does not touch the scrotum, lest severe ulceration should ensue The patient should be seated in an arm chair, the legs wrapped with cloths after the application; if no result is witnessed, another application must be made on the next day, and so on, till a sufficient vesicular eruption is produced. (Trousseau, Clinical Lessons and Treatise on Therapeutics.)

uncompensated mitral diseases, you will see passive non-inflammatory effusions in the pleura and peritoneum. These effusions sometimes become so abundant that they hinder the regular functional operations of organs most necessary to life. Allow me here to study separately this question in its relation to the two great serous cavities.

In certain diseases of the heart, to the trouble of the circulation, and especially to the concomitant albuminuria, are added pulmonary œdema and a double pleuritic effusion which is not generally large in amount. There are, moreover, cases in which you will observe a one-sided effusion, constituting a hydrothorax, which seriously aggravates the respiratory distress already produced by the heart disease itself. In these cases, despite the persistence of the cause of the hydrothorax, and the almost absolute certainty that there will be a return of the effusion, if asphyxia threaten, do not hesitate to aspirate the chest.

This operation may indeed render signal service; it restores equilibrium to the circulation and respiration, and enables you again to apply your medicines to advantage. You may be able by this means, not only to relieve the patient, but to prolong his life for months. Siredy had reported instances of the kind, and for my part, when such cases occur, I do not hesitate to aspirate.

As for ascites, this is a question which presents

far greater difficulty, and demands much fuller consideration.

The affections of the heart, as you know, are often accompanied by a special cirrhosis, called *cardiac cirrhosis*, characterized by the fact that the venous net work of the portal vein is choked out by the swelling of the radicles of the hepatic veins, which participate in the mechanical stasis of the inferior cava. This condition is the opposite of that in true cirrhosis, in which the compression of the radicles of the portal vein takes place at the periphery of the lobule; here we see the pressure beginning in the center of the lobule, and operating from the center to the periphery, causing that post-mortem appearance in the liver known as *nutmeg liver*. In these cases, whether of true, or of cardiac cirrhosis, the circulatory disturbances in the portal and hepatic veins always manifest themselves by a more or less abundant out-pouring of serum into the abdominal cavity; hence you will not be surprised to see in cardiac cirrhosis, ascitic effusions quite as pronounced as in true cirrhosis. What treatment should be pursued in such cases? From past experience, I cannot but regard paracentesis or aspiration in ascites connected with true cirrhosis, as an operation more injurious than useful, and in my hospital service you see me very seldom resort to this operation in such dropsies. I have in fact always observed that patients rapidly become enfeebled under the influence of this operation, and as the obstruction in the liver

necessarily remains the same, reproduction of the effusion rapidly takes place in the abdominal cavity after tapping, and this kind of "white bleeding" only exhausts the patient, and cuts short his days. Hence, deaf to the importunities of the patient, I defer tapping as long as possible, and only resort to it in the event of asphyxia.

Is this mode of proceedure, which I regard as good in cases of true cirrhosis, also applicable to cardiac cirrhosis? One might be tempted to reply in the affirmative, when having in mind the heart lesion and the consecutive hepatic lesion; paracentesis, in fact, is a palliative measure which has no action on the primary and determining cause. I am disposed, however, to be less rigorous on this point, and to regard abdominal paracentesis as of more utility in cardiac than in true cirrhosis. Let me explain: Cardiac cirrhosis, which is due, I repeat to the mechanical congestion of the hepatic radicles, is not to be compared from the point of view of its persistency and importance, with true cirrhosis resulting from the gradual and progressive development of the connective tissue elements.

It is, in fact, easy to understand that if you can succeed in modifying the circulation in the vena cava, you may diminish the varicose development of the intra-lobular and sub-lobular veins, and the hepatic radicles generally, and thus lessen the pressure on the portal system. So when you are in presence of a pa-

tient suffering from a cardiac affection, if the cachectic state be not too advanced, if the œdema of the lower limbs be not too great, at the same time that the ascites is abundant, you can perform paracentesis with advantage, especially if the effusion impedes the functions of the diaphragm, and thus augments the trouble of the cardiac circulation.

These cases are less rare than you would think, and you will see, if you have not already seen, patients who, sufferers from mitral affection, present this peculiarity, that while having but little œdema of the lower extremities, they have considerable ascites. It is true that the diagnosis is often doubtful, and that one may well ask if he has not to deal with a disease of the heart co-existing with true cirrhosis.

Cirrhosis is, you know, an affection depending on a chronic inflammation of the liver, an inflammation having often for its origin the passage through the lobules of the liver of alcohol which has been ingested in excess. Your patient then may have been a hard drinker, and you readily see how both of these affections may exist together, cirrhosis with the mitral affection. In these cases the diagnosis is very difficult, though the march of the disease and the signs derived from an attentive examination of the patient may help clear up the diagnosis. In presence of these facts, whether doubtful or not as to the pathological condition, do not hesitate to tap and relieve the heart. If you have to do with true cirrhosis, its course will be but little

modified, while, on the contrary, if you have to do with cardiac cirrhosis, the operation will permit an active medicinal treatment to have its effect, and thus prolong life.

Such, gentlemen, are the rules which you are to follow in the general and local treatment of dropsies.

NOTES TO LECTURE III.

I. ACTION OF DIGITALIS ON THE KIDNEYS.

In reference to the action of digitalis on the kidneys, opinions are as discordant as the views entertained respecting the action of this drug on the heart.

According to some authorities, the urinary secretion is augmented; according to others, it is diminished. Joerg and Hutchinson affirm a stimulant action on the kidneys, followed by increase of urine; excessive doses inflame these organs. Sanders, Hufeland, Bouley, Alberts, Murray and Trousseau admit an augmentation of the urinary secretion under small doses of digitalis.

Other authorities contest these statements. Traube, Wunderlich, Hirtz, Coblentz, Stadion, Winogradoff, of St. Petersburg, Siegmund, of Vienna, etc., regard digitalis as having no direct action on the renal secretion. But if digitalis is not a diuretic in the physiological state, it becomes such in the pathological state (as in dropsies), and the diuresis is a consequence of the action of digitalis on the heart. In regulating the heart, it regulates the general capillary circulation, and in this way prevents blood stasis, restores the normal functional integrity of the renal organs, and hence produces augmentation of the secretion (Hirtz, Vulpian).

Coincidently with increase of diuresis there is a fall in the density of the urine, there is a notable decline in the per centage of urea (Miegevend).

According to more recent experiments, we are obliged to admit as demonstrated the diuretic action of digitalis, especially when it is given in maceration. Lorain, in giving to dropsical patients digitalis in powder, has often seen their weight decrease by as much as 45 pounds in the course of eight or ten days, owing to the diuretic action of the digitalis. The diuresis, moreover, is in the ratio of the amount of the effusion, and when the patient is rid of his dropsy the urinary secretion falls toward the normal. Sometimes, however, no diuretic effect is obtained. In such cases, according to Gubler, the want of success depends on functional debility (if not on actual structural degeneration) of the kidney, which no longer reacts, or presents the conditions of vitality necessary to produce abundant diuresis.

Dr. Lozes, a pupil of Lorain, and under the direction of the latter, has made a careful study of the diuretic properties of digitalis, using for this purpose the scales and a graduated glass measure, and he has made comparative weighings of dropsical patients, and the amount of urine voided by them. He affirms as the result of his experiments that digitalis has a diuretic action much more general than Hirtz supposed, and that other forms of dropsy besides those from heart disease are benefited by it. (In his experiments he gave the powder of digitalis in 25 to 30 centigram doses in wafers.)

In opposition to the views that the diuretic action of digitalis is in relation to the augmentation of the blood pressure, Lauder Brunton and H. Power, of London, affirm that digitalis acts by producing spasm of the arterial system, soon followed by relaxation of the vessels. (Centralblatt, 1878, No. 32.)

2. DIURETIC PROPERTIES OF CAFFEINE.

Gubler was one of the first to call attention to the diuretic properties of caffeine. At the Société de Thérapeutique,

Session Nov. 27th, 1877, he related an interesting case of a man affected with organic disease of the heart with hepatic cirrhosis and œdema of the inferior extremities and of the abdomen. Digitalis gave but little result, while after the administration of caffeine, diuresis was abundant from the second day, and gradually amounted to four and a half quarts a day. *Apropos* of this observation, Gubler called attention to this important fact, that under caffeine diuresis is abundant and almost instantaneous, while under digitalis the augmentation of urine does not appear until the second or third day.

Pursuing his researches, Gubler found that caffeine and its salts did not alone possess the property of diuresis, and that certain other alkaloids isomeric with caffeine—theine, mateine, guaranine, had similar properties. Guaranine seems even to hold the first place among these alkaloids; its diuretic action is powerful and prompt; a patient who voided scarcely 800 cubic centimetres of urine, voided the next day under the influence of guaranine, 2,800 cubic centimetres.

From a physiological point of view, there is an important fact to note, namely, that while the urine augments in quantity there is a fall in the pulse, the pulse curve and the urinary secretion thus being in inverse relation. Diuresis comes on the same day or the next day; it may then be said that the action is instantaneous, an important fact when a speedy diuresis is wanted; the depression of the pulse curve is not noticed till the next day. Through the abundant watery diuresis the blood-pressure augments. This is contrary to the effect produced by digitalis, since, under the influence of this drug, we see the pulse first augment in frequency, then diuresis take place. Caffeine is then of especial utility where a prompt diuretic action is desired, and where no other medicine is tolerated. The dose is two to five grains twice or three times a day.

According to Gubler, there is, properly speaking, no such

thing as citrate of caffeine. Caffeine, which is an alkaloid, forms very unstable salts with acids, and it makes little difference in practice whether one has a salt of caffeine or caffeine in its purity. As for bromhydrate of caffeine, it is a little less soluble than caffeine.

All these different alkaloids, caffeine, theine, guaranine, are prescribed in doses amounting to 50 centigrams (or about 7½ grains) daily. The following is a good formula:

Take of caffeine (theine, mateine), 0.50.
Syrup of tolu, 30.
Peppermint water, 80.
M. Sig. To be taken in divided doses daily.

Following the administration of caffeine, neither the diminution of sleep nor the mental excitement—which some authorities have noted—have been observed by Gubler. The patient sleeps a little more than ordinarily, but the sleep is determined not by the direct action of the medicament, but by the favorable modification which the caffeine effects in the general condition of the organism. One does not, in short, observe all the phenomena of excitation which succeed the administration of coffee; these excitant properties are probably due to a volatile substance, cafeone, which does not exist in the alkaloid. According to Gubler, these different alkaloids co-operate in stimulating the renal secretion.

3. MILK AS A DIURETIC.

MILK can hardly be said to have been employed by the ancients for medicinal purposes. It was first recommended as a powerful therapeutic agent by Petit-Radel, and still later by Christien of Montpellier. (Petit-Radel "On milk considered as a medicament and its various uses," Paris, 1876; Christien, "On the utility of milk administered as a remedial agent and aliment in dropsical affections," Arch. Gen. de Med.

1831.) To-day galactotherapy is a well recognized system of therapeutics, and to such an extent is this mode of treatment carried, that there are numerous milk cure establishments on the continent where milk is almost the only aliment and medicament employed.

The milk should be given as pure as possible, and skimmed before being drunk; it should be sipped slowly, and no less than two or three quarts a day should be ingested.

A few days after the institution of the milk regimen, (sometimes two, sometimes three, sometimes four days), there will in most cases be noted an augmentation of diuresis, and if after eight days no such increase is noticed, it will be best to stop the milk treatment, since the main object of the regimen has not been attained; *i. e.*, a diuresis proportional to the quantity of milk ingested.

At the onset constipation is the rule with some patients; in others, however, milk produces, especially if drank in large quantities, diarrhœa, but this diarrhœa is of short duration

How is the milk treatment conducted? Here practitioners differ, some order an exclusive milk diet—no other food or drink is permitted; others counsel a mitigated regimen, i. e. milk with bread, oatmeal. etc.; others, still, a mixed regimen, that is to say, the ordinary diet plus two or three quarts of milk a day.

When it is desired to leave off the milk diet, this cannot be done suddenly, especially if the patients have been living on milk exclusively; a little less milk should be given, and this with plenty of bread or other solid food, and gradually the ordinary fare may be resumed.

Galactotherapy has been recommended in diseases of the stomach, and especially in dropsies, whether the latter be idiopathic, or symptomatic of affections of the kidneys or heart, (asystolia is a contra-indication), and of late milk diet has been

advised for pleuritic effusions and the chronic dysenteries of warm climates.

Germain Seé condemns the exclusive milk diet in diseases of the heart, and prefers a mixed regimen; which is as follows:

The patient should take 2½ quarts of milk a day, *i. e.* one quart in the morning fasting, 1 quart at 4 P. M. and ½ quart in the evening or during the night time, and should eat his ordinary meals. (G. Sée, Maladies du Cœur, 1879. and Des Dyspepsies, 1883)

CHAPTER IV.

TREATMENT OF PASSIVE CONGESTIONS OF THE DIFFERENT VISCERA.

SUMMARY.—Congestion of the Encephalon—Dangers of Opium—Bromide of Potassium and Chloral—Pulmonary Congestion—Revulsives, Cupping, Blisters—Emetics—Aconite—Expectoration and Expectorants—Balsamics—The Cough of Cardiac Patients—Pills of Cynoglossus—Hæmoptysis—Ergot—Blood-letting—Its Indications—Local Blood-letting—Congestions of the Liver—Congestions of the Kidneys.

We are now about to take up the treatment of the different local congestions and the symptoms resulting therefrom. When in a previous lecture I described the evolutionary cycle traversed by the affections of the heart, and showed you that having been first local, they afterwards become general, I made it easily understood how that the different viscera, little by little, become the seat of blood stases owing to the mechanical obstruction in the general circulation. Lungs, brain, liver, kidneys, become passively congested, and this congestion very soon produces a perturbation more or less profound in their functions. To combat these hyperæmias, the physician must resort to appropriate therapeutic means.

One of the most frequent of these congestions is that which pertains to the cerebrum, and one has only to observe the livid, cyanosed, swollen face of patients

suffering from mitral lesions, to understand that this congestion of the face does not exist alone, but that the hyperæmia must affect the encephalon as well.

This blood stasis generally produces drowsiness, hebetude, and torpor, sometimes insomnia, or even in the last period of diseases of the heart, a semi-comatose condition. At the same time, however intense may be the state, the intellectual faculties seem intact, and nothing is more common than to see cardiac patients maintain mental clearness to the very last.

But in other cases there exists a real intellectual disturbance, and thus it is that Maurice Raynaud, Peter and Mottet have recorded observations of maniacal delirium in patients affected with mitral lesions. The study of these encephalopathies of cardiac origin is one of the most interesting chapters in the pathological history of affections of the heart, and I shall return to it when I come to speak of aortic lesions. But what gives a particular character to the cerebral troubles, is that, from a therapeutic point of view they may be remedied by treatment directed exclusively to the heart.*

*Nasse was one of the first to affirm mental alienation as the result of cardiac disease. Romberg, of Berlin, has also pointed out the co-existence of insanity with cardiac affections, but one of the most complete memoirs on this subject is that Saucerotte, who cites seven cases showing the relation which certain mental disorders bear to diseases of the heart.

In 1876 Dufour gave the result of 61 autopsies of insane

Here, gentlemen, you are to use remedial applications aimed at the congestive symptoms, and I must remind you at the same time that in the course of cardiac diseases other cerebral phenomena, having quite a different origin, may supervene, and especially in mitral affections; and in this connection I need only refer you to the uræmic accidents so liable to occur and which depend on the profound disturbance entailed in the functions of the kidneys by the cardiac malady.

TREATMENT OF THE ENCEPHALIC CONGESTION.

What are you to do for the congestion of the encephalon? What will you do to combat the persistent and painful insomnia for which the patient urgently demands relief? For this insomnia, employ bromide of potassium and chloral, but discard opiates in mitral lesions.

You will see, as we go on, that from the point of

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persons, made at the Asylum St. Gemmes, at which were noted 44 cases of cardiac lesions, or 70 per-cent. In 19 cases the mitral was found diseased and in 16 the sigmoid valves. In 4 cases there was lesion of both valves. In 11 the cardiac tissue alone was affected (a).

(a) Nasse, Arch. für medic. Erfah. und Zeitsch., 1818.—Romberg (de Berlin), Zeisth., von Masse, 1822.—Saucerotte, De l'influence des maladies du cœur sur les facultés intellectuelles et morales de l'homme (Annales médico-psychologiques, 1844).—Dufour, Notes sur les altérations du cœur, du sang, des veines (Annales médico—psychologiques, 1876).—Hirtz, De quelques manifestations cérébrales dans les affections cardiaques (Thése de Paris, 1877).—Limbo, Des encéphalopathies d'originie cardiaque (Thése de Paris, 1878).

view of the employment of opium, mitral diseases stand in a category quite distinct from that of aortic, opium being dangerous in the one set of maladies, but of unquestioned utility in the other.

Recall to mind, for instance, the physiological action of opium and the congestion which it produces in the cerebro spinal axis; you will readily understand how the use of opium must augment the congestion due to mitral lesion.s But, if it is not safe to employ opium in these cases, you may, on the contrary, derive excellent results from bromide of potassium and chloral.

CHLORAL.

With regard to chloral, you know how world-wide is the use of this remedy since its discovery by Liebreich; unfortunately, however, this new medicament has been too often abused. Chloral is a very energetic caustic, and in the experiments which I undertook with Hirne to ascertain the uses of chloral when employed externally, we showed that this body is escharotic, and that its application to the skin determines sloughing.

It will not do to forget this important fact, especially where large use of this medicament is made by mouth. In fact, that severe irritation which chloral occasions when applied to the skin and to wounds, is likely to be experienced when this drug in too concentrated a form is taken internally; and the feeling of burning in the throat, of smarting along the œso-

phagus and in the stomach, is clearly referable to the irritant action of this medicament, as clinical and experimental tests have proved.

I have observed, and you may have occasion to observe, patients who, as a result of a too persistent use of this medicine, have experienced gastric symptoms similar to those which follow a too prolonged usage of the alcohols, namely those of a more or less acute catarrh of the stomach. In animals killed shortly after the ingestion of chloral, congestion, ulceration, and hæmorrhages of the mucous membrane have been noticed. Laude, of Bordeaux, has also remarked the same disorders in a patient who died shortly after having taken chloral.

So, notwithstanding the singular tolerance of the stomach for irritant medicinal substances, there is no doubt whatever that the immoderate use of chloral does determine grave affections of the mucous membrane. Hence, it is well for you, as far as possible, to find some other inlet for the introduction of chloral. Here the chloral enema will often serve you a good purpose; this rectal method was first counselled by Gorrequer Griffith, and introduced by me into French practice. The chloral is combined with milk and the yolk of an egg. This is my way of administering it:

To a wineglassful of milk in which the yolk of an egg has been beaten, add from one to three teaspoonfuls of the following solution:

℞ Hydrate of chloral, 10 grammes:
Water, 100 grammes.
M.

For one rectal injection, which should not exceed four fluidounces, and should be retained by the patient.

Some patients refuse to take chloral in this way, and you will be obliged to administer it by mouth; remember, then, never to give this medicament in substance (in capsules for instance), but dissolve it in a large quantity of water. The syrup of chloral is a good preparation containing 1 gramme (15 grains) of chloral to every 25 grammes (a little less than a fluidounce) of some of the officinal syrups. You can also give your chloral in milk or mucilage. Chloral, when absorbed, acts very much after the mannerof chloroform, and without entering into the discussion whether its action be in every way identical with that of chloroform, which would take us away from our subject, we can assume this fact as proved that the sleep which follows chloral comes about by cerebral anæmia. Hence, the utility of this drug in mechanical congestions of the encephalon. *

* The following formula for a syrup of chloral is furnished by a Committee appointed to report concerning new medicines. (1887).

Take of syrup of bitter orange peel, 950 grammes.
Crystallized hydrate of chloral, 50 grammes.

Dissolve the chloral in the syrup of bitter orange and filter. One tablespoonful contains one gramme (or 15 grains of chloral.

You will then give from 1 to 2 gms. of chloral, but you will not leave the patient free to take this medicine when he pleases; you should give careful directions as to its administration, knowing the danger which may arise from its use, a danger from which not even the heart is exempt. Vulpian, Franck and Troquart have, in fact, shown that when chloral is introduced into the veins of animals it determines a paralytic state of the heart. It is then a medicine whose administration shouid be carefully watched, and should not be too prolonged.

BROMIDE OF POTASSIUM.

In most cases you will give preference to bromide of potassium. I showed you in a previous chapter that the bromide deserves a place among the tonics of the heart. I pointed out its regulating and bracing action on this viscus, and shall have nothing more to say on that topic; I am now concerned only with the hypnotic action of the bromide. Whatever may be the mode of action of this remedy, whether it act primarily on the blood-vessels or on the nerves, it makes but little difference; it is sufficient to know that it produces calm and repose when its employment is prolonged.

You will give the bromide in solution, but you must remember that this medicine does not act immediately, that its effects are slow, and that sleep is not generally produced till after four or five days. You

should apprise the patient of this; tell him that the regular sleep which he so urgently demands will not be obtained till he has taken the medicine for days or even weeks. Such are the means to be employed to combat the insomnia.

To oppose the other symptoms which result from the cerebral congestion, you may have to direct the treatment to the heart itself, and resort may be made to some of the heart tonics before mentioned. Promote regular and free action of the bowels; and in some cases you may be obliged to have recourse to blood-letting, but this is a subject which I shall treat more at length in another place.

PULMONARY CONGESTION.

The lung is one of the organs whose circulation is oftenest disturbed in mitral affections, and in the train of symptoms constituting the disease of the heart, I told you that the lesser circulation was the first to be smitten. This it is which explains the frequency of the congestions and the attacks of bronchitis which result; these congestions are ordinarily passive, but sometimes they take on quite an acute character and are attended with fever.

These passive congestions of the lungs make themselves known by respiratory distress, by sibilant râles, more or less fine, more or less numerous, more or less extensive, by an expectoration of variable intensity, by an obstinate cough, and sometimes by

hæmoptysis. You should direct your treatment to all of these symptoms, and one of the most active means which we possess is certainly the revulsive method, applied in the form of dry cups in variable number, or fly-blisters made to cover a greater or less extent of the thorax.

A propos of cupping, Junod has devised a powerful apparatus of which he has vaunted the use; I refer to those cups which go by the name of their inventor, and which cause so energetic a determination of blood to the skin, and which you have seen me utilize in my service.* Notwithstanding the real advantages of this method, I regard its application to practice as likely to be very limited, and this principally by reason of the difficulty of procuring this apparatus if one is practising in the country, and also by reason of the pain which these cups occasion, especially when applied to the inferior members. Cases have occurred where the prolonged application of "Junod's boots" has caused rupture of blood-vessels and effusion of blood into the muscular parenchyma, or into the subcutaneous cellular tissue, the extravasated blood giving rise to extensive suppurations. We had one case of the kind in our service.

* These cups are of metal or of glass, and communicate by a rubber tube with an aspirator, which exhausts the air. Junod has given to this method the name of *hæmospasia* He has constructed hæmospastic apparatuses for all parts of the body; those best known are *Junod's boots*, which are applied to the leg.

Along with the local means which have a real action in passive congestions, certain medicines may be mentioned which are of considerable utility. Some of these have a double action; they aid expectoration, and by the muscular efforts which they occasion they compress the parenchyma of the lungs, like a sponge, forcing out the blood with which those organs are engorged. Such a result is obtained by emetics; ipecacuanha acts in this way, and I have seen good effects follow its administration. But be careful in the exhibition of emetics; old people vomit with difficulty, and in the case of cardiac patients, efforts of vomiting, painful enough of themselves, occasion such congestions of the face and encephalon that it will be prudent to resort very seldom to this remedial measure for fear of provoking rupture of blood-vessels in the cerebrum.

Tartar emetic has also been advised. This medicament is especially applicable to acute congestions and inflammations of the cerebrum. I think that you had better be chary of antimonials in heart affections. But there is a medicament which has a marked influence on congestive states, and which is much employed abroad, though little used in France; I refer to aconite.[1]

The neglect into which aconite has fallen is largely due to the bad quality of many of the pharmaceutical preparations of this drug in the market. The alcoholic tincture of the leaves is generally employed; this is an untrustworthy preparation, which even in large doses

gives hardly appreciable results. As Oulmont has shown in his remarkable studies of aconite, this plant possesses toxic and therapeutic properties quite different according to the place where it was gathered, and according to the part employed. The departments of Vosges and Dauphiné seem to give the best aconite, and the root is the part which contains the largest proportion of the alkaloid.

If you administer this medicine, do not choose the alcoholic tincture of our pharmacopœias, but the alcoholic tincture of the root (obtained from Vosges), and while you would prescribe the first in gramme doses, you would give the second in drops. You will, then, give the alcoholic tincture of the root, in the dose of one drop every hour during most of the twenty-four.

You might employ Duquesnel's crystallized aconita, but this alkaloid is so active (it will not do to give more than 2 milligrammes [$\frac{1}{30}$ grain] in the twenty-four hours), that I think that it had better be reserved for cases of neuralgia, and that in pulmonary complaints you should limit yourselves to tinctures of the root, obtaining the best preparations that you can find in the market.

In certain circumstances it is not so much the congestion that you are to combat, as the consequences, in the form of a more or less abundant expectoration. Now, in acting on the pulmonary mucous membrane, and in modifying its secretion, you relieve the cardiac

patient. The modifiers of the bronchial secretion are of two orders: the expectorants, properly so called, and the balsams.

The cough is often a painful complication of this passive congestion of the lungs, especially if to the congestion be added œdema. You must then treat the cough by endeavoring to alleviate its intensity, and here there are numerous therapeutic resources at your command.

I have spoken of the caution which you should exercise in the administration of opium in mitral affections, and of its danger; you are not obliged, however, altogether to exclude this drug, and in associating it with other medicaments, and in giving it in feeble doses, you may employ opium and its derivatives to palliate the cough of cardiac patients.[2]

Among the opiate preparations which I regard as the very best to quiet the cough, are the pills of cynoglossus, which have the following formula:

℞ Pulv. rad. cynogloss,
Semin hyos. niger,
Ext. opii vinos, aa ʒ iv,
Pulv. myrrh, ʒ vi,
Olibani, ʒ v,
Croci sativi
Castor, aa ʒ jss,
Honey or syrup opii, q. s.

Make into a pill mass, divide into pills of 4 or 5 grains each. Give one pill when required. The paregoric elixir of the pharmacopœias is also a very eligible and useful adju-

vant to cough mixtures for cardiac patients. Bouchardat's pill of sulphate of morphia $\frac{1}{6}$ gr. and sulphate atropia $\frac{1}{120}$ gr. is also a useful pill for some occasions.

Cherry laurel water has also a decidedly calmative action on the cough, and may be given in teaspoonful doses three times a day in a cup of warm sweetened milk. The cherry laurel water is, as you know, the product of distillation of the leaves of the lauro-cerasus, and contains a little hydrocyanic acid. [The aqua lauro-cerasi of the B. Ph. is filtered after distillation; it is of rather uncertain strength.]

There is, lastly, a frequent complication of mitral diseases, and which often attends passive congestions of the lungs; I refer to hæmoptysis. Germain Sée has even described under the name of *hæmoptoic* certain abnormal forms of affections of the heart.

There have been many explanations of cardiac hæmoptysis; some authorities have regarded it as due to emboli, which by obliterating the branches of the pulmonary artery, determine an augmentation of tension in the capillary network and rupture of the capillaries; others have refered the hæmoptysis to increase of tension in the pulmonary circulation by the fact of the cardiac lesions; lastly, it has been attributed in some cases to alterations of the blood vessels.

Without stopping to dwell long in this place on the treatment of hæmoptysis, which belongs to the therapeutics of diseases of the lungs, I will give you a few hints as to the course to pursue.

I shall only just allude to medicaments with which in this connection you are well acquainted, namely

acids and astringents, to give emphasis to a drug which will give far better results in these hæmorrhages, I refer to ergot of rye. You will make use more especially, of the hydro-alcoholic extract, to which has been given the improper name of ergotin, a name which would lead you to think that it was an alkaloid —which it is not; for while the alkaloids are the active principles of plants, and produce their results in much smaller doses, it is necessary to give twice as much ergotine as ergot to produce the same effect.

But I have another important remark to make from the point of view of the administration of this medicament, namely that its introduction by the mouth seems notably to diminish the action of ergotin, so that if, for example, you are obliged to give by the mouth as much as four to six grammes a day to produce a given effect, a few centigrammes will suffice to produce the same effect when injected under the skin. You will prefer, then, the hypodermic method, making use, if you like, of the following standard solution, * of which you may inject one gramme, or about a hypodermic syringeful.

℞ Ergotin, 2 gms.
Neutral glycerine, 15 gms.
Water, 15 gms.

M.

These injections are sometimes followed by a

*This formula must be credited to Moutard Martin.

slight local irritation, though seldom by abscess. I regard the hydro-alcoholic preparation of Yvon as preferable to Bonjean's ergotin.

You have also seen me in my hospital service use in these cases with success a new alkalold which Tanret has extracted from ergot, namely ergotinine. We give this ergotinine by mouth in syrup, or by the hypodermic method. The results obtained by Molé, by Solmon, and by myself in the treatment of hæmorrhages prove that you may henceforth substitute this alkaloid for ergot of rye, having care to give very small doses, half a milligramme ($\frac{1}{120}$ gr.) to a milligramme ($\frac{1}{60}$ gr.) for a daily dose.

BLOOD-LETTING.

Some authorities have even counselled blood-letting in the treatment of hæmoptysis of cardiac origin; this is a point of some importance, and one which demands our attention.

Blood-letting has been much vaunted in cardiac affections; it has been supposed capable of freeing the heart's cavities of their excess of blood, and of promoting the cardiac contractions; hypertrophy was once combated by this means An attentive examination of the facts, however, has shown that no such results are obtained, and that venesection has only a temporary effect.

We now know that in proportion as a certain quantity of blood is abstracted from the general cir-

culation, it is almost immediately reproduced, not in quality, it is true, but in quantity, for the water from the tissues passes by endosmotic action into the blood-vessels to compensate for the loss of blood. With regard to the supposed influence of blood-letting in opposing the gradual hypertrophy of the ventricle, this is also a great mistake, due chiefly to the writings of Valsalva; and I have already told you that to lessen the hypertrophy (supposing this to be possible), would be a great calamity to a cardiac patient, for it is owing to this hypertrophy that the circulation is kept good.

But if blood-letting has no direct influence on the hypertrophy, it certainly modifies the blood profoundly, producing anæmia and hydræmia. These alterations in the blood lead to excited action of the heart and manifest disorder, and I need only call your attention in this connection to the palpitations of anæmic persons, after prolonged losses of blood, to convince you that any modifications produced by blood-letting are detrimental. You will then eschew venesection in mitral diseases, as augmenting the useless labor of the heart. I would therefore advise you to repudiate the instructions of the old authorities (Andral, Valsalva, Broussais, etc.), and in the treatment of organic and chronic diseases of the heart avoid blood-letting as likely to do more harm than good.

This exclusion of blood-letting from the therapy of cardiac affections is not, however, absolute, and

despite my repugnance to venesection in these cases, I recognize the fact that there are certain conditions that call for this operation; when, for instance, asphyxia is imminent.

In cases of pulmonary congestion, when the face of the patient is cyanosed, livid, and the pulse is scarcely perceptible; when you take in at a glance that if this state continues death must ensue, and ensue quickly; in the case, moreover, of a young patient in whom the asphyxia seems to be an unforeseen accident (as it were), not the ultimate phase of the malady, do not hesitate, but let blood.

Under the influence of phlebotomy, amelioration is soon observed, the pulse regains its force, the circulation is re-established in the engorged lung, and the next day you find your patient notably relieved. But this new state is a deceptive one, and unless you institute an energetic treatment to prevent the return of the congestive accidents, the amelioration will soon give place to an aggravation of the symptoms, due to the new conditions in which the patient finds himself after the venesection.

In other cases there is intense cerebral congestion; here you may bleed to advantage from one of the veins of the arm or from the temporal, and you will often succeed in unloading the vascular sluices of the encephalon. But here you cannot be too careful; blood letting is an extreme measure, and must be reserved for grave cases, where all else has failed; nor

should you forget that the patient often pays dearly for a factitious and temporary amelioration by an aggravation, after one or more days, of all the general symptoms.

Local blood letting is less dangerous. Authorities have advised to apply wet cups to the chest to combat the pulmonary congestion due to diseases of the heart, and leeches to the mastoid processes to attenuate the effects of the cerebral congestion. Leeches have also been applied to the arms, in order to relieve the mechanical congestion of the portal vein; this therapeutic procedure is, however, little in use to-day, and is rather to be reserved for active inflammatory occasions, than for the mechanical and passive congestions of the viscera.

From the point of view of chronic diseases, and especially that of diseases of the heart, do not forget that bleeding is only a palliative measure, which may sometimes give excellent, immediate results, but at the cost of enfeebling the patient. In the experience of our fathers it was a common custom, it is true, for patients with heart disease to be bled every year, and they would require it, but it was a very bad practice. You ought to bleed only in certain special cases, and, as before said, under very exceptional circumstances.

HEPATIC CONGESTIONS.

The liver, like the lungs and kidneys, may become congested. Already, while on the subject of

abdominal dropsy, I spoke to you of the passive congestion of the liver, and that particular alteration described under the name of *cardiac cirrhosis*. I rapidly traced the points of resemblance as well as the points of difference, between this pathological state and true cirrhosis, and showed you how unlike the cirrhosed liver is the nutmeg liver.

This hepatic congestion, which is a very frequent attendant on heart affections, is one of the most manifest signs of non-compensation. Along with the œdema of the extremities, you will hear a patient complain of more or less pain in the hepatic region; percussion shows an augmentation of volume of the liver; the coloring matters of the bile or the urine accumulate in the blood, and a jaundiced hue is recognized in the conjunctiva, while the presence of bile pigment in the urine is a further indication of the icteroid condition.

What will you do to combat this congestion, often so painful and irksome? You will make use of means similar to those employed in hyperæmia of the lungs, that is, revulsives and especially vesicatories. Monneret rightly extolled revulsives in hepatic congestions, and I have always derived benefit therefrom. But, to obtain good results, it is necessary that the fly-blister shall be of large size.

RENAL CONGESTIONS.

The kidney, as well as the liver, undergoes pas-

sive congestion under the influence of the mechanical impediments to the circulation arising from mitral disease. But the symptoms are quite different. While in the case of the liver, we observe icterus, and the more or less profound lesions which characterize cirrhosis, here, on the other hand, we note two periods in the congestion of the kidneys: first, the passive distention of the renal veins, whence arises an impediment to the free functional working of the glomerules and more or less diminution of the urinary secretion; then, if the congestion continues to progress, tissue alterations take place in the kidney, which manifest themselves by the passage of albumen in the urine.

We have seen that the first period, characterized by the diminution in the secretion of urine, may be favorably modified by digitalis. As for the albuminuria, you will treat it principally by the milk diet. There are other means of combating this affection which I shall consider at some length when I come to treat of the therapeutics of diseases of the kidneys.

As you see, gentlemen, I have passed successively in review before you the different kinds of treatment necessitated by the various local complications of mitral maladies; I have shown you the means proper for combating the paresis of the heart, if the affection is not compensated, and I have set forth the dietetic rules demanded in these cases when the heart muscle is sufficient for its task.

By all that has been said, you will observe that the

resources which the physician has at his command are rich and varied, but also (and this is a matter of considerable importance) that, in order to obtain the desired effects, he must know how skilfully to manage his medicines, giving them at their proper times and in their proper doses. In following these directions you will see that in these formidable affections, despite the incurability of the mitral lesions, the efforts of the practitioner will often be crowned with success, both in the prolonging of life, and in the marked relief conferred on the patient.

In the next lecture I shall set forth the treatment of aortic affections.

NOTES.

I. ACONITE IN HEART DISEASE.

[There is a popular impression (favored by the practice of some specialists) that aconite in small doses acts as a regulator of the heart, and it has been administered for this purpose in disorders of that organ both of functional and organic nature. A common practice is to give two drops of the tincture of the root every two hours, and to continue the administration for weeks and even for months. It is undoubtedly true, however, that in the United States the use of aconite is largely restricted to the treatment of acute inflammations. It is a matter of very general belief that aconite will cut short, or hasten the resolution of an inflammation. If it is of benefit in cardiac affections, it would seem to be more by virtue of its anti-congestive properties (promotive of the remote circulation) than by any direct effect on the nerves or muscle of the heart that it does good.

According to Ringer, in pharyngitis and tonsillitis great

relief is soon experienced by doses of half a drop to a drop of the tincture every ten minutes or half hour for two or three hours, then hourly; and, according to this same authority, two-drop doses hourly relieves nervous palpitations. Aconite, according to Rabagliati (Braithwaite's Ret., Part 80, p. 66,) causes, first, spanæmia, then, second, capillary congestions, something like the reaction from exposure to cold. Aconite cures because it depresses the vaso-motor system, and hence lowers the excitement of febrile reaction. For which reason the dose should be small.

In the United States the tincture of the root is almost exclusively employed, though the fluid extract of the Pharmacopœia is of definite strength, and is probably a more reliable preparation.—TRANS.]

2. URETHAN, PARALDEHYDE, HYPNONE.

Within a year or two three new hypnotics have been added to the materia medica; these may in some cases be substituted to advantage for chloral in mitral affections, The first is urethran, which seems to be relatively safe; dose, ʒ ss to ʒ j in sufficient water. Urethran seems to have very little toxic power.

Second, Paraldehyde; dose, 30 to 45 grains; is best taken in a little rum and water. Paraldehyde is less irritating than chloral, and is not a cardiac poison. It is, however, less analgesic than chloral and not so good a hypnotic.

Third, Hypnone; discovered in 1885, introduced into therapeutics by the author of this work. Dose, two to four drops. Hypnone is a hypnotic of feeble power, but in some cases may replace chloral and render good service.

[An account of these new hypnotics may be found in "New Medications," by Dujardin-Beaumetz; George S. Davis, Detroit, publisher.—TRANS.]

CHAPTER V.

TREATMENT OF LESIONS OF THE AORTIC ORIFICE.

SUMMARY.—Aortic Lesins— Divisions — Stenosis, Its Relatively Favorable Diagnosis—Aortic In sufficiency—Train of Symptoms— Dilatation of the Heart—Dilatation of the Aorta – Disturbance of the Cardiac Plexus—Angina Pectoris—Cerebral Anæmia—Its Causes—Its Results—Its Treament—Therapeutics of Aortic Affections—Indication for Opium— Means of Administering Opium—Antagonism of Opium and Belladona.

Gentlemen, I told you in my first lecture that if it is not needful for the practitioner to keep constantly in mind all the divisions that have been laid down in descriptions of diseases of the heart by the authors of treatises on internal pathology, it is nevertheless of importance clearly to differentiate mitral from aortic affections. I have shown you that it is on account of not having followed this rule that physicians have sometimes wrought confusion in the therapeutics of these lesions.

Several chapters have been devoted to the treatment of mitral lesions; I come to-day to the study of lesions of the aortic orifice, and in accordance with the course pursued in the first part of this work, I shall briefly describe the train of symptoms and the pathological sequences which characterize aortic affections.

While in the case of mitral lesions you are warranted by reason of the frequency of their coincidence (which becomes a pathological law) in uniting in one description mitral constriction and mitral insufficiency, in the case of aortic lesions, on the contrary, it is necessary to separate insufficiency from stenosis, for very often these two lesions exist the one without the other.

Of all the organic lesions of the heart, aortic constriction is one which is accompanied with disorders of the least gravity, and also one which may persist throughout the entire life without manifesting itself by very appreciable disturbances. This affection, you know, is determined by induration of the sigmoid valves or of the circumference of the aortic orifice, an induration which causes a diminution in the calibre of the vessel.

To overcome the difficulties occasioned by this lesion, all that often is necessary is a slight degree of hypertrophy of the left ventricle, which, by the increase of force thus gained, effectually opposes the existing obstacle to the outflow of the blood into the aorta. You see, then, that if the stenosis is not too great, if the lesion is single, and not complicated with other valvular alterations, compensation will be easily effected. Often, even, you will be surprised to see in your practice persons who present all the appearances of good health, and who have nevertheless been long affected with a cardiac lesion characterized by an in-

tense *bruit de souffle* with the first sound and at the base, indicating aortic constriction. As a general thing, you will need only to note the lesion, and wait for disorders to manifest themselves on the part of the circulation before attempting any treatment.

Facts of this kind, which are of common occurrence, are sufficient to convince you of the truth of what I have said, that of all the organic diseases of the heart the least dangerous is certainly aortic stenosis.

It is not so with insufficiency, which, on the contrary, is an affection accompanied with grave disorders of the circulation, disorders which differ essentially in their aggregate from what you will observe in mitral lesions, even when these have attained their maximum of intensity.

MECHANISM OF THE SYMPTOMS.

What happens when there is aortic insufficiency? At the precise period when the left ventricle, after a vigorous contraction, has discharged its contents into the aorta, just at the time when the sigmoid valves are wont to close firmly to stay the reflux of blood into the ventricle during the diastole, the morbid condition of these valves prevents their perfect coaptation, and the consequent complete closure of the orifice of the vessel; there is a welling back of blood from the distended arterial tree, and the left ventricle then is the recipient of two blood currents at the moment of dias-

tole, the one normal from the auricle which empties itself by contraction, the other abnormal from the aorta, which in its turn begins its contraction. Under the influence of this double inflow, the distended ventricle dilates, and being under the necessity of putting forth an extra amount of work in order to clear itself of its contents, to this distention soon corresponds a compensatory hypertrophy; but at the same time the mechanical conditions which preside over the closure of the mitral orifice are modified, so that the mitral in its turn becomes incompetent, and little by little are seen to unfold themselves all the phenomena which accompany mitral affections.

But the dominant facts which ought especially to fix the attention are: the dilatation of the heart, auricle, and aorta, and the local and general disturbances which supervene after this sort of blood-letting, so to speak, which takes place at each ventricular contraction.*

*The dilatation of the left auricle, and the hypertrophy of its walls, rather than the hypertrophy of the left ventricle, are considered by Franck and Deborde as the true causes of compensation in aortic insufficiency. The hypertrophy of the walls of the auricle, in fact, enables the latter to contract more energetically, and to discharge its blood into the ventricle with a force sufficient to overcome the pressure of the blood contained in the ventriculo-aortic cavity. The dilatation of the auricule is important also in that it permits at each contraction the projection of a greater quantity of blood, which frees the pulmonary circulation. If it were not so, says Franck, we should often see in these cases congestions of the lungs, pulmonary apoplexy, œdema, etc.

Aortic insufficiency is, of all diseases of the heart, that which determines the greatest increase of size of that organ; the name *cor-bovinum* (bullock's heart) has been applied to hypertrophied hearts thus occasioned.

Moreover, this exaggerated distention of the ventricle entails the following consequences: At each ventricular contraction, a considerable quantity of blood is discharged into the aorta, and distends the entire aortic system, principally the points nearest the heart. You have, moreover, a ready means of becoming cognizant of this energetic diastole under the influence of the dilated ventricle; when you feel the pulse of a patient affected with aortic insufficiency, you find a bounding pulse, offering all the characters of what has been described under the name of *Corrigan's pulse* (bounding and compressible pulse). The sphygmograph also well expresses this arterial dilatation by the vertical and considerable ascent of the needle as you see by the tracing here given:

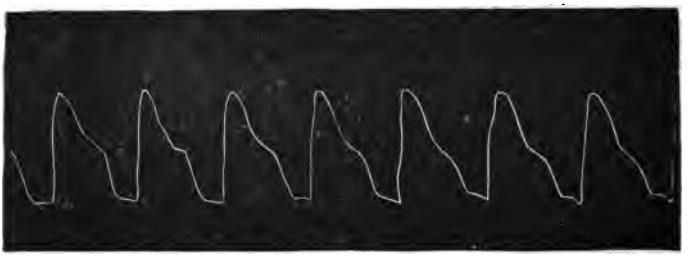

FIG. 1.

This dilatation of the aorta, the mechanical consequence of insufficiency, which is also dependent on an anterior lesion the distention of the ventricle, itself due to the insufficiency of the aortic valves, produces effects important to know. It determines in the sphere of the nerves which embrace the base of the heart, (*i.e.* in the cardiac plexus,) lesions and symptoms due, as Peter thinks, to an inflammation of this plexus —to a neuritis, or possibly, as others think, to a special irritation—to a neuralgia of this plexus. Whether it be neuralgia, or neuritis, this complication gives rise to a symptomatic aggregate described under the name of angina pectoris.

In other cases the connection of the cardiac with the pulmonary plexus explains how there may be a reverberation to the lungs, and how is it that dyspnœa may also be a mechanical consequence of this particular dilatation of the aorta. Lastly, it will not do to leave out of the account the nerves which traverse the mediastinum, and whose function may be more or less impaired by the distention of the heart and aorta.

But this is not all: you will find that this incomplete occlusion of the arterial system when the latter comes to be distended by the blood stream thrown by the contracting ventricle, also has grave consequences; it is a veritable blood-letting (to use my former comparison) which takes place at the moment when the arterial systole begins, a systole which demands for its performance two periods which are well demon-

strated by the sphygmograph; first, the sharp line of ascension, then the gradual march of the needle of the instrument. The sharp line of ascension indicates the rapid and forcible dilatation of the vessel. Then equilibrium being restored, the vessel contracts slowly, just as in the normal state.*

In departments of the economy far from the centre, there is an important organ, the encephalon, which particularly suffers. There are many reasons why the brain should be injuriously affected: first because it receives numerous large arteries; secondly, because the parenchyma traversed by these vessels is of extreme delicacy; but next and chiefly, because, as has been shown by Hammond and Claude Bernard,

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* [As soon as the systemic circulation is overloaded from insufficiency of the heart, or from secondary mitral insufficiency, the pulse becomes feeble and irregular upon the slightest exertion, and it may intermit, but it is still of the same peculiar jerking character. The sphygmograph tracings of this pulse show a high upstroke, and an absence of the dicrotic wave. The vibrating pulse, or the pulse of unfilled arteries, is usually possessed of fulness of volume, but when obstruction coexists, it may be small and flickering, unless the arteries are calcified, or atheromatous. The pulse of aortic insufficiency, taken by the sphygmograph, resembles strongly the senile pulse, but the latter gives a rounded, instead of a pointed summit. The peculiar crochet or beak is noticeable in graphic tracings of the pulse of aortic insufficiency.—Dr. A. L. Loomis.]

and as Mosso's curious experiments have proved, (a) the cerebral activity is in relation with the arterial circulation. It is easy then to understand that the modifications which supervene must occasion a notable and profound perturbation in the intellectual faculties and cerebral functions.

Hence you will not be surprised to learn that in patients afflicted with aortic insufficiency mental labor becomes difficult, and that if they preserve their intelligence intact, or nearly so, they own, nevertheless, that they cannot apply themselves to work demanding considerable and prolonged mental strain; they rapidly undergo fatigue.*

In my own practice I have observed men occupying high political stations, who have found to their sorrow that from the time that their aortic insufficiency took on a well marked character, they could no

* The cerebral troubles observed in aortic lesions, and especially in aortic insufficiency, are as follows: 1, Vertigo, when the patient rises to dress in the morning. There may even be convulsive attacks of an epileptiform character. 2, Insomnia; 3, Intellectual disturbances; and according to Saucerette, there may be an exaggerated development of the moral sensibility. But the fact of greatest frequency and importance, is the profound irritability of individuals affected with aortic disease, an irritability which writers have described under the name of *irritable weakness* (*faiblesse irritable*).

(a) Gracimini and Mosso, Graphic study of the movements of the cerebrum. (Bull. de Ther., 1877.)

longer devote themselves, as before, to their official duties. Moreover, these patients were sufferers from vertiginous attacks, dazzling sensations before their eyes, fainting spells, all depending on the cerebral anæmia, an anæmia which has not seldom resulted in mortal syncope.

Armaingaud of Bordeaux (in a treatise published in 1878) has described certain hysteriform symptoms which have been noticed in individuals laboring under aortic affections. Bucquoy, Ferrand and myself have pointed out the co-existence of troubles of the intelligence with these same affections, and I have laid particular emphasis on the very special irritability which patients affected with aortic lesions present. What, moreover, well shows the relation which exists between aortic affections, on the one hand, and the cerebral phenomena on the other, is that the latter may disappear under the influence of a treatment directed to the valvular disease.

I cannot here enter into the details of the causes of sudden death in this dangerous malady.(1) These causes are multiple; but whatever may be the explanation given, whether this accident result from anæmia of the cerebrum or bulbus, or from the excessive distention of the ventricle, it is nevertheless true that sudden death frequently terminates the life of individuals affected with aortic insufficiency.

As you see, this description differs markedly from that which pertains to mitral affections, and might en-

able one, at first glance, to recognize a patient suffering from aortic lesions. I would have you bear in mind this fact, that the striking characteristic of the aortic disease is that the principal symptoms are directly referable to anæmia. The complexion is pale; the pulse regular, but bounding, jerky, as I have shown you; ascents (going up stairs, up hills), the standing posture, muscular efforts, a violent gust of wind, determine faintness, vertiginous attacks, even complete syncope. The patient complains of beatings in the ears, of pain over the breast bone; he has labored respiration, the dyspnœa is intermittent (in paroxysms) accompanied often with pains shooting down the arms; moreover there is little, if any, œdema, no swelling of the liver or pulmonary congestion; in a word, none of the local troubles of mitral affections.

These different symptoms require different therapeutic measures, and, as you see, the treatment must be modified and adapted to all these circumstances. At the onset you will rarely have an indication to augment the contractile force of the heart, ordinarily sufficient; in other cases, you will have recourse to the tonics of this organ, and in this connection Prof. Teisser, of Lyons, has shown that digitalis may also, in lesions of the aortic orifice, give favorable results.

In aortic insufficiency, it is not the fault of the heart if there is anæmia of the arterial system, it is the fault of the valves, and you can do nothing to remedy this lesion. Your efforts will be directed towards

combating the anæmia by a treatment designed to augment the local circulation in certain organs, and of these, you know that the brain is the most important. Therefore almost always it is against the cerebral anæmia and its consequences that you should contend by appropriate means.

TREATMENT BY OPIATES.

I have before said that in the treatment of compensated mitral affections there is one heroic remedy, digitalis; in aortic insufficiency the medicine which above all others is efficacious in giving relief is opium. Opium opposes the two great symptoms which result from lesions of the sigmoid valves—the cerebral anæmia and the dyspnœa; it also directly combats the neuralgias of the aortic and pulmonary plexus.*

*"Opium," says Gubler, "when taken into the circulation determines a particular excitation, gives fulness to the pulse, raises the temperature, augments the injection of the teguments and promotes diaphoresis. The countenance brightens, the eyes become brilliant and moist, the pupils contracted, the skin covered with perspiration, then quiet sleep ensues. All these are phenomena of congestion, and opium seems to produce in all the organism what section of the cervical cord of the great sympathetic produces in the face." In his "Commentaries on the Codex," Gubler states the same view. He explains the hypnotic effects of opium by the static congestion of the meninges and cerebral substance which it produces. The cerebral congestion reflects itself in the eyes, the vessels of the iris are so dilated that the pupil is well nigh obliterated.

The cases reported in Huchard's memoir seem to us con-

If experimental therapeutics have, in fact, well shown the congesting action of this medicament, a property which you can use to advantage in aortic insufficiency, clinical medicine has put in clear light the excitant action of opium and its derivatives, and Gubler, Thaon,† and others have shown, by numerous examples, how morphine, in stimulating the cerebral functions, deserves to take a place in the group of tonics. Renault and especially Huchard, have also demonstrated the action of morphine in controlling dyspnœa, from whatever cause; they have shown that of all the means employed in these cases, the most energetic is indisputably this alkaloid, and, as Huchard says, morphine gives the power to breathe.‡

These conclusions, which seem to be well substantiated, find their application in the treatment of

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firmation of Gubler's view, and show the good effects of the congesting action of opium in cerebral anæmia, due to aortic insufficiency.

† L. Renault, De l'opium dans la médication tonique (Th. de Paris, 1876.) H. Huchard, De la médication opiacée dans l'anémie cérébral du aux affections du cœur (Journ. de Thérap., 1877). A. Gubler, Indications comparées de la morphine et de la digitale dans le cours des affections organiques du cœur (Journ. de Thérap., 1877). A. Renault, Influence des injections sous-cutanées de chlorhydrate de morphine contre la dyspnée (Union médieale, 1874).

‡ Huchard, De la guérison rapide des accès d'asthme par l'emploi des injections hypodermiques de morphine et de l'action hypnotique de l'opium (Union médicale, Oct. 1878, p. 638).

aortic insufficiency. Recently, moreover, Huchard and Gubler have called attention to the happy effects of morphine in certain affections of the heart.

So then, when you have before you a case of aortic constriction or insufficiency, with dyspnœa, or paroxysms of angina pectoris, when you observe the symptoms of cerebral anæmia, vertigo, syncope, do not hesitate, but resort to opium.

What are the preparations likely to be most useful? What mode of introduction is best? In reply to the last question, I would say: unquestionably the subcutaneous. As to the form of opium, morphine presents the greatest advantages. Here in our wards you see me every day employ morphine hypodermically for the relief of aortic affections. What solutions shall you use?

In the United States Magendie's solution of morphia is a proper form in which to order this alkaloid, as all apothecaries are familiar with its formula. Magendie's solution is made as follows:

Take of sulphate of morphia, gr. xvi.
Cherry laurel water, ʒ i.
M.
Dose.—Ten drops for a hypodermic injection, containing about one-fifth of a grain.

I have substituted cherry laurel water for plain water in the above formula, for morphia can be preserved indefinitely in this menstruum without decomposition. Moreover, the solution in cherry laurel

water is not at all irritant. Solutions in water are apt soon to become turbid from the development of mucedines, which spoil the solution, giving rise even to the production of apomorphia, which has been found in these altered solutions. A common formula of my own contains one gramme of muriate of morphia to fifty grammes of cherry laurel water. A syringeful contains two centigrammes (about $\frac{1}{3}$ gr.) of morphia.

In America much use is made of hypodermic tablets, which contain from $\frac{1}{8}$ to $\frac{1}{4}$ grain of morphia with or without $\frac{1}{100}$ or $\frac{1}{120}$ grain of atropia; the tablets with morphine and atropine are to be preferred.

It is hardly necessary that I should say much about the mode of giving a hypodermic injection. With a syringe armed with a short needle, you pick up a fold of skin in a fleshy part, as the back, the thigh, the hip, or a fleshy part of the arm; you thrust in the needle perpendicularly to the surface of the skin, and when you feel the point of the needle free in the subcutaneous cellular tissue, you deposit the injection. If you make your injection in parts where the skin is tense, and where there is less muscular development, you will have to insert your needle horizontally, and the operation is somewhat more painful.

The commencement dose when used subcutaneously, should be small, $\frac{1}{15}$th or $\frac{1}{10}$th grain; not more, for instance, than 5 drops of the Magendie solution. You can repeat these injections as occasion requires; but I insist upon this point, that you should always

make the injection yourself; do not leave it for the patient to do for himself. Many a patient has become hopelessly addicted to the morphine vice by allowing him this liberty. Lewinstein has well described the train of symptoms arising from such abuse, to which aggregate of morbid phenomena he has given the name *morphiomania.*

Some persons cannot bear morphine, whether from individual predisposition, or because the smallest doses determine vomiting; in these cases the association of morphine with atropine sometimes helps the former alkaloid to be better tolerated.

I know that authorites have affirmed that there is a complete antagonism between these two alkaloids, making them clinically incompatible.[3] I cannot accept this view, either with regard to their toxic or therapeutic antagonism, and this for the following reasons:

The experiments of Fraser and Bennett, under the auspices of the British Medical Association, and the more recent experiments of Knapstein of Bonn, go to show that from the point of view of toxic action morphine and atropine, far from exercising a mutual antagonism, supplement the effects of each other; these experiments, moreover, coincide with those made by Bois of Aurillac, in 1855. So much for toxic antagonism.

Any supposed therapeutic antagonism is just as unfounded, and clinical authorities have long shown

the happy results of the association of these two medicaments. Gros of Algiers, Fourcault in France, and Oliver in England, have demonstrated the advantage in certain cases of combining atropine and morphine in subcutaneous injections. In my practice I am in the habit of associating these alkaloids after the following formula:

Take of Muriate of morphia, 0.10 centigr.
Sulphate of atropia, 0.01 centigr.
Cherry laurel water, 20.00 grammes.
M.

One gramme contains one-half centigramme of morphine and one-half milligramme of atropine. You will inject the whole of a syringeful, and you will obtain by this happy combination more active results than by morphine alone, even in patients the most susceptible to this alkaloid.

When, for any reason, you do not employ morphine injections, you can give opiate preparations internally; any of these may give favorable results. There are the various English and French tinctures, the syrup of the French Codex, the extract of opium, which is especially to be commended, and may be given in doses of one-sixth of a grain to a grain. This extract contains morphine and codeia in the state of meconates; it is mostly destitute of narceine, meconine, narcotine, thebaine, and the fatty resinous matters of the drug. Another good preparation is the vinegar of opium, which may be prescribed in the dose of two,

three, or four drops, in a little sweetened water or valerian tea. This vinegar of opium is the famous English "black drops," and is made by macerating Smyrna opium with nutmeg, saffron and sugar in distilled vinegar. One drop represents one-third part of its weight of extract of opium, and is about twice the strength of common laudanum.

To sum up, then: for the dyspnœa and cerebral anæmia you have a capital remedy in opium and its preparations. I know of but one contra-indication to the use of this drug in these cases, namely, renal degeneration.

ELIMINATION BY THE KIDNEYS.

The elimination of medicines, as I shall hereafter show you, has a rôle of some importance in connection with their therapeutic action, and when from any cause the kidneys are disabled from doing their work, serious mischief may result to the economy from even small doses of the toxic alkaloids introduced subcutaneously. Bouchard, and more recently Chanvet,* have called attention to this fact. This is why physicians have now and then done much harm by giving their patients in an advanced stage of Bright's disease hypodermic injections of morphine.

You have recently seen pilocarpine produce the same disastrous effects in our hospital service. You

* Inaugural thesis.

remember the patient who cccupied No. 1 ward, St. Lazare, and who presented at the autopsy that rare and almost unique lesion, vegetative endocarditis of the sigmoid valves of the pulmonary artery. It was a case of Bright's disease, far advanced. In consideration of the uræmia from which he seemed to be suffering, and the anuria with which he was affected, we at once thought of pilocarpine, and hoped that subcutaneous injections of this alkaloid would bring about, by the profuse sweats which it would occasion, elimination of the urea which was poisoning his blood. The result did not correspond to our expectations, diaphoresis did not take place, and the patient succumbed one hour after the hypodermic injection was given. Here, the autopsy proved that it was the bad state of the kidneys that was responsible for this unfortunate result. Hence, then, you should carefully examine the urine of your patients, and not practise hypodermic injections of morphine or any other alkaloid unless you are sure that the kidneys are in a healthy state, and that the medicament will find a rapid elimination by this emunctory.

But let us return to the treatment of aortic affections. I have shown you that for the dypnœa and cerebral anæmia, opiates give the promptest and best results, and the same may be said of that most painful complication of aortic diseases, angina pectoris. Here there is no speedier mode of relief than hypodermics of morphia with the first threatenings of an attack.

You know well from your observation of cases in our hospital service, that patients affected with angina pectoris always experience before the paroxysm certain prodromes; thus it was with a private patient whom I was attending along with Peter; the pain commenced in the left hand, travelling up to the shoulder, and finally gaining the heart. At the moment then when the patient complains of pain in the hand (if you have a case of this sort), apply your morphine injection and you will arrest the attack.

Opiates, then, may render important service in aortic diseases, and you will have to resort to them, but do not forget that notwithstanding the advantages which attend their use, serious evils may follow their prolonged administration. The smaller doses which first gave relief soon prove inefficacious, and larger doses are required, and the dose must constantly be increased to meet the demand. The patient is on a downward grade where it is difficult to arrest the descent; he becomes more and more dependent on his morphine, and the time will come when from immense doses he will not realize the same benefit which he formerly derived from a minimum quantity.

Here, then, is the rock on which you may be wrecked, unless you are very careful in the adminstration of opiates; and to oppose the untoward symptoms which aortic lesions determine, you will do well to employ modes of treatment which, without being as

heroic and certain as opium and its derivatives, may nevertheless render you signal service, in enabling you to suspend for a time the opium treatment, and at the same time keep the patient in a fair condition of comfort. It is to the consideration of these various therapeutic means that I shall devote the next lecture.

NOTES TO CHAPTER V.

I. SUDDEN DEATH IN AORTIC DISEASE.

Sudden death is quite frequent in diseases of the aorta, Cœlius Aurelianus, Lancisi, Senac, in 1778 studied the causes of this fatality; then came the labors of Morgagni and Burns in 1809, of Mesta in 1811, of Kreysig in 1816, all of whom attributed sudden death in aortic maladies to the thinning of the walls of the heart and alterations of the orifices, no more definite explanation being given; then Gendrin (1842), Aran (1849), Briquet (1856), and Maurice, wrote treatises on the same subject. Some have ascribed the fatality to syncope others to rupture of the heart, to fracture of one of the semi-lunar valves, etc., others still to anæmia of the bulbus.

Some authorities have affirmed that in aortic insufficiency, the reflex current of the blood into the ventricle is likely by repeated shocks to cause dilatation of the ventricular walls, destroy their elasticity, and make them unfit for their function. Mauriac attributes the final syncope to myocarditis; the coronary arteries receiving less and less of blood, the blood-pressure in these vessels diminishes with stasis in the coronary veins. The muscular fibres suffer in their nutrition, become feeble, more and more incapacitated for their work, and finally fatty. In this condition any violent emotion (as an outburst of anger) may cause sudden death.

Others (as before said) ascribe sudden death to anæmia of

the brain or bulbus. Potain and Rendu regard it as generally due to ischæmia of the heart, owing to obliteration of the coronary arteries. In other words, in accordance with Mauriac's views as above expressed, and those of more recent pathologists, the heart muscle gradually loses its power to contract, and dies from lessened afflux of blood and inanition.

Peter finds the sufficient cause of sudden death in that neurosis of the cardiac plexus, of which he makes so much account in the symptomatology of aortic affections. Debord thinks that the disorders of the central innervation. insomnia, cephalalgia, vertigo, even the syncope, so common in aortic insufficiency, are due to the great variations of blood pressure, and the great changes of calibre which the arteries undergo, and principally to the irregularity of the arterial circulation in the nerve centres.

Normally, after a severe muscular effort, there is a fall in the arterial pressure; this circulatory modification, which is without inconvenience to a man with a healthy heart, may be disastrous to an individual with aortic insufficiency. In the latter, the arterial pressure is generally lessened and is likely at any time to become weaker still, whence may result sudden cerebral anæmia, and fatal syncope. G. Debord, "On incertain modifications in the intra cardial circulation in aortic sufficiency. (Thesé de Paris, 1878).

2. ANTAGONISM OF ATROPHINE AND MORPHINE.

J. Hughes Bennett, as a result of eighty experiments on dogs and hares has come to the following conclusions:

1. Sulphate of atropine is within certain limits the physiological antagonist of meconate of morphia.

2. Meconate of morphia causes harm after a large dose of sulphate of atrophia, death arriving sooner if morphine be given than if it be withheld.

3. Meconate of morphia is not the specific an-

tagonist of the action of sulphate of atropine on the vaso-motor nerves of the heart.

The favorable effect of sulphate of atropine after the administration of large doses of meconate of morphia, is probably due to the action which the former exercises on the blood-vessels. Atropine causes their contraction, and thus diminishes the danger of death from cerebral and spinal congestion, so characteristic of large toxic doses of morphine introduced into the economy. One may therefore to a certain extent (experiments do not indicate precisely how far) combat the tendency to death in morphine poisoning by stimulating the heart, through the sympathetic system, by sulphate of atropine.

According to Heaton's conclusions (*Medical Times*, 1875), opium can only antidote belladonna when the latter has not been taken in massive doses. He affirms that the delirium caused by belladonna may be calmed by opium, but if the former drug has already produced stupor, the effects of the opium will be added to those of the belladonna, and will augment the coma.

CHAPTER VI.

TREATMENT OF SECONDARY DISORDERS DUE TO AORTIC AFFECTIONS.

SUMMARY.—Nitrite of Amyl—Its Physiological Action —Applications to Diseases of the Heart — How Employed — Contra-indications for Nitrite of Amyl— Trinitrine—Therapeutic and Physiological Action—Mode of Administration—Angina Pectoris; Nature and Treatment—Electricity—Action on the heart—Neuritis of the Cardiac Plexus — Revulsives—Bromide of Potassium— Iodide of Ethyl.

We have seen in the preceding chapter, that in aortic affections, morphine and opiates have for their end, not only to combat the anæmia resulting from the disorders of the arterial circulation caused by the lesion of the sigmoid valves, but also the dyspnœa, so common a symptom in these affections, and the pain from which the patient suffers. I shall now show you, gentlemen, that there are other medicinal agents which accomplish the same end, and I shall begin with the study of two comparatively new medicaments: nitrite of amyl and trinitrine, and you will see that the latter merits a permanent place in the therapeutics of aortic maladies.[1]

Although discovered in France by Balard as early as 1844, it is nevertheless to English physicians that we owe our knowledge of the physiological and

therapeutic properties of nitrite of amyl. Guthrie, in 1859, published the first trials with this medicament; he was followed by B. W. Richardson in 1863, and by Gamgee, Lauder Brunton, Haddon, Forster, Farquarhson, H. C. Wood, etc., still later, who pointed out the therapeutic uses of nitrite of amyl, while in Germany, Peck, Guttman and Eulenberg, Bernheim and Felhne, studied the properties of this chemical body.

In France, since the researches of Amez-Droz, in 1873, published in the Archives of Physiology, several treatises have appeared, and especially worthy of note are the memoirs of Bourneville, Marsat and Veyrières. In Belgium, the monograph of Van Ermengen, published recently at the University of Louvain, claims attention as an able presentation of the subject.

Nitrite of amyl, or amyl nitrous ether, possesses the singular property of causing a marked flushing of the face. All that you have to do, in order to witness this phenomenon, is to pour a few drops on a handkerchief and cause them to be inhaled by some person; the odor is somewhat pungent, not disagreeable, resembling that of certain pears. At the end of a few seconds the face is seen to flush, the eye becomes brilliant, the patient complains of feeling dizzy, the skin becomes warmer and the pulse more frequent. In a few minutes the action of the medicament is at its maximum, then shortly the effects pass off, and the patient is as he was before the inhalation. These phenomena, so marked in respect to the visage

when from five to ten drops are respired, are much more pronounced when larger doses are employed; the face takes on a violaceous hue, and the congestion is so intense that the blood seems ready to ooze through the skin and mucous membranes.

This flushing, which so notably affects the face, also attains the encephalon, as is proved by simple inspection of the cerebrum in a trephined animal: at each inhalation an intense congestion of the meninges is produced, and the brain is seen to become turgescent and protrude, hernia-like, through the opening in the cranial vault.*

At the same time that there is cerebral congestion there is modification of the pulse, which augments in frequency while its tension diminishes; if the effect is too pronounced, it becomes irregular.

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* Bader, ophthalmologist of St. Guy's Hospital, has observed by the ophthalmoscope augmentation of volume of the retinal arteries and veins, as well as those of the iris. Engelmann, MacBride, Steketee, Schüller, etc., have noticed in trepanned animals the intense injection of the vessels of the meninges and turgescence of the brain above mentioned. According to Schüller, the dilatation of the vessels of the pia mater is very apparent after three or four inspirations of nitrite of amyl. (a)

(a) Bader, The Lancet, 1875.—Steketee, Thèse d'Utrecht, 1873.—MacBride, The Chicago Journ., 1875.—Schüller, Berlin. klin. Wochenschrift, 1875.

See art. Nitrite d'Amyl, in Diction- de Thérap-, by Dujardin-Beaumetz.

I cannot here enter into the physiological history of nitrate of amyl,[2] although the subject is one of exceeding interest. Without then discussing the various physiological explanations which have been proposed to account for this flushing of the face and meninges—whether you adopt Richardson's view that the amyl nitrite has a direct and immediate action on the heart, augmenting its contractions; or whether you take the view that it produces its effects by paralyzing the vaso-constrictors; or whether you explain its action by an influence which it exerts on the blood, the fact none the less remains, and with respect to the physiological effects of nitrite of amyl these two particulars stand prominently forth: lessened arterial tension, with increased frequency of the beatings of the heart, and the intense flushing of the face, the cerebrum and its membranes.

Why the tension is lessened is plain enough; the flushed state of the blood-vessels permits a more ready transit of the blood and lightens the work of the heart. But it is none the less true that, whether directly by its action on the heart, or indirectly by its action on the nerves or on the medulla oblongata, the nitrite excites the contractions of the cardiac muscle and acts as a stimulant to the circulation.

This tonic action on the circulation is, I admit, very transient, especially when the dose is small, and gives place, with increase of the dose, to a real paralysis of the heart and circulation. This, gentlemen,

is a phenomenon which you will frequently note when studying the action of medicines. I have showed you that it is so with digitalis; you have seen how this marvellous tonic of the heart becomes in large doses a paralyzer of that organ. It is the same with nitrite of amyl, the results differing according to the dose employed.

These facts being established, it is natural that clinicians should have thought of applying the known cardio-stimulant, cerebral-congesting properties of amyl nitrite to the treatment of aortic affections.*

Like every other new remedy, amyl nitrite has been tried in a variety of complaints from cholera to tetanus and epilepsy, but no systematic use was made

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*Guthrie, in 1859, was the first to propose amyl nitrite for the relief of "fainting turns," and since then it has been a common practice among physicians to employ this medicament for the sudden syncopes and losses of consciousness connected with cerebral anæmia. The writings of Dabney, Burral, Bordier, Schüller, Goodhart, Bader and Monroe show the good results which may be obtained from nitrite of amyl in the cerebral anæmia (which has been many times fatal) arising from chloroform inhalations. To-day the antidotal action of amyl nitrite and chloroform seems well established. It is not so, however, with the alleged antagonism between this body and strychnia. (*a*)

(*a*) Dabney, The Richmond and Louis. Med. Journ., 1874.—Burral, New York Med. Gaz., 1870.—Bordier, Journal de Thérap., 1874.—Schüller, Berlin. klin. Wochenschrift, 1874.—Bader, The Dangers of Chloroform, etc., and Nitrite of Amyl (The Lancet, 1875).

of it in cardiac affections, save in angina pectoris (for which disease, dependent for the most part on cardiac lesions, it was many years ago recommended by Lauder Brunton), till it occurred to me to utilize its well known properties in the treatment of maladies of the aortic orifice, where it has proved itself a powerful auxiliary to opium, combating not only the painful angina, but also the tendencies to syncope of those affections.

How ought you to employ this medicament? Assure yourself first that your nitrite of amyl is pure, and remember that if it be exposed to the air it speedily spoils by the formation of hydrocyanic acid; keep it then in tightly-stoppered bottles, away from the light, and be certain before resorting to its use that the reaction is not acid.

There are three modes of introduction of nitrite of amyl; by inhalations, by mouth and by hypodermic injection. Of these means the most certain is by inhalation. Pour five, six, seven or more drops (not exceeding ten) on a handkerchief, and cause the patient to breathe the vapor for a few instants till the congestive effects arising therefrom are experienced. English physicians, for convenience, keep the requisite quantity of amyl nitrite in capillary tubes, which are carried by the patient, and broken when needed.

The nitrite of amyl may also be given by mouth. I have made trial of this method, but find it far inferior to that of inhalation. It has also been employed

hypodermically, being little irritant to the subcutaneous tissues. I have no experience with this mode, which I believe to be less satisfactory than the first mentioned.

The introduction of nitrite of amyl into the treatment of diseases of the heart, was a step in progress, nevertheless the usage of this remedy has never been very popular; this is due both to the difficulties of its administration, and the transient character of the effects produced. It is not so, however, with

TRINITRINE

which, as you will see, has all the advantages of nitrite of amyl without the inconveniences.

Trinitrine, which is also known under the name of nitro-glycerine, and out of which the Swedish engineer, Nobel, was the first to manufacture that explosive and dangerous substance, dynamite, was first employed in therapeutics in 1850, under the name of glonoine. True to their theory, the homœopaths have applied this vaso-dilator poison to the treatment of cerebral congestions.

Since the labors of Field, Bruel, and especially Vulpian, we have been acquainted with the physiological and toxic effects of trinitrine, which Murrell was one of the first to recommend for the relief of attacks of angina pectoris. Huchard has, more than any other experimenter, contributed to the popularity of this medicament in France. Dr. Marieux has re-

cently, under my direction, made an excellent study of trinitrine, and we have shown its great value in certain affections of the heart and aorta. (a)

When three or four drops of a one per cent solution of trinitrine are injected under the skin of a man, you observe after a few seconds a marked flushing of the face, the skin becomes red and covered with sweat, the eyes are injected; the patient experiences headache, buzzings in the ears, and he feels as though his head would burst; the beatings of the heart become more active. These congestive effects are not limited to the periphery; you will notice by the ophthalmoscope the same flushing of the retina, an indication that the deep parts of the encephalic circulation are affected. These are, as you see, the same phenomena which nitrite of amyl produces, with this difference, that the effects of the former are much more prolonged, lasting several hours.

The physiological study of trinitrine has brought to light another curious fact, which shows us how difficult it sometimes is for us to apply the data of experimentation on animals to the treatment of human diseases. Trinitrine, in fact, which in man produces toxic symptoms in as small a dose even as ten drops

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(a) **Marieux, Researches on the Therapeutic and Physiological properties of Trinitrine. Thèse de Paris, 1883. Dujardin-Beaumetz, New Medications, Chapter, "New Cardiac Medicaments," G. S. Davis, Detroit. Hughes, Action of Homœopathic Medicaments, etc.**

of the one per cent. solution, seems to have no action on the dog and hare. Marieux and I have injected as much as three fluid drachms of this alcoholic solution under the skin of a hare without determining any appreciable toxic effect. This explains why such different views as to the toxic action of trinitrine have been put forth, and while Bruel regards it as one of the most violent poisons, Vulpian affirms that it is almost inert.

How are you to employ trinitrine? You should use only the one per cent. alcoholic solution, of which the dose is one or two drops three times a day. The prescription may be written as follows:

℞ Alcoholic solution of trinitrine (1 per cent.) gtt. xxx.
Water. 300 grammes (℥ x).

M. Sig. Half a tablespoonful to a tablespoonful three times a day.

You can also employ the subcutaneous method, using the following solution:

℞ Solution trinitrine (1 per cent.) gtt. xxx.
Water, grammes x.

M. Sig. For hypodermic use. Every fifteen minims (or an ordinary hypodermic syringe full) contains three drops of the solution of trinitrine.

By the employment of trinitrine you will obtain good effects in aortic affections complicated with cerebral anæmia, but where this medicament produces its best results is in the treatment of the painful symp-

toms which so frequently accompany lesions of the aortic orifice, and which have been described under the generic name of angina pectoris, concerning which I desire now to say a few words.

Under the term angina pectoris have been included most of the painful phenomena referable to the heart, but my colleague, Huchard, who has studied with so much care the various forms of angina pectoris, has established, from both a prognostic and therapeutic point of view, a fundamental distinction betwen *true* and *false* angina pectoris.

True angina pectoris is that disease described by Rougnon and Heberden, which almost inevitably causes death, and which is characterized by obliteration of the coronary artery and the resulting cardiac ischæmia (Herard, Huchard, Potain, Sée).

The pseudo-anginas may also be the result of divers causes (neuralgia, dilatation of the heart, etc.), or, like the true anginas, may be due to ischæmia, which, however, is but transient and results from a vaso-motor disturbance in the circulation of the heart muscle; certain nervous or abdominal affections and certain kinds of poisoning in particular may be the starting point of this vaso-motor trouble.

Whether determined by direct alterations of the blood vessels or by reflex action, this cardiac ischæmia is none the less tributary to a treatment which has for its basis the vaso-dilator poisons, at the head of which we must place trinitrine, nitrite of amyl, and morphia.

So, whenever you have a patient with symptoms of thoracic angina, you should order trinitrine with injections of morphine. If the latter are preferable at the moment of the paroxysm, the development of which they prevent, they present the serious disadvantage of making morphiomaniacs of these cardiac patients; so while recognizing the utility of these injections, I believe trinitrine is the better remedy, and in my practice I have derived marvellous results from it.

ELECTRICITY IN CARDIAC AFFECTIONS.

But there are still other means which have been advised in these cases, concerning which I desire to say a few words; let us begin with electricity.

The application of electricity to the treatment of cardiac affections is of recent date. Durosier thought that by electricity it might be possible to favor the contractions of the heart; and that just as we see energetic muscular movements produced under the influence of interrupted currents, so there were grounds for hoping that the application of these currents to the precordial region would cause contractions of the heart muscle, and combat asystolia. The results have not fulfilled these expectations, and the question may still be asked, if the application to the thoracic walls of Faradic currents and currents of great intensity has a real and effective action on the myocardium?

But if the usage of electricity in cardiac paresis has not given all the effects desired, it has produced certain results in the treatment of angina pectoris.

Duchenne, of Boulogne, was the first to treat angina pectoris by the application of interrupted currents. He employed for this purpose a metallic brush connected with the battery which bears his name, passing this brush back and forth over the mammary region; and in some cases he obtained complete disappearance of the paroxysms and real cures. But along with certain successful cases, there were others which were not merely failures, but where the treatment was an injury. Under the influence of the Faradic current, instead of disappearance of the painful thoracic paroxyms, more violent attacks seemed to be provoked, and this it was which caused Duchenne of Boulogne in the latter part of his life, to abandon this treatment.

One day, in fact, a patient presented himself at his office and asked to be treated for angina pectoris by electricity. Duchenne began with great caution to apply the electrodes, and almost immediately the patient was taken with an attack of angina, and went into a state of syncope from which Duchenne with difficulty resuscitated him. Dr. Crisaphis who relates this fact, and who was present on this occasion, tells me that Duchenne was so shocked by this event which came so near being fatal, that he declared that he would never again resort to electricity in cardiac angina.

But if interrupted currents are dangerous, it is not so with constant currents, Fleiss several years ago

(*Berliner Klin. Wochenschrift*, 1865) proposed for the relief of certain cardiac affections the application to the pneumogastric of descending galvanic currents; electro-therapeutists have long pointed at the benefits which may be derived from galvanism in the treatment of neuralgias. It is on these facts that the employment of galvanism in the treatment of angina pectoris has been based. Hubener, Cordes, Fluebuch, and more recently Armaingand have reported cases of this disease cured by galvanic electricity, and I have personally witnessed an interesting case of this affection, which was complicated with aortic insufficiency, and was signally benefited by this means.

In the case of this patient the attacks came on in this way; the hand was first taken, then the arm, then the shoulder, and from this point the pain streamed to the heart, and produced all the characteristic symptoms of cardiac angina. To arrest the march of the pain, Peter and I, who were attending the patient, proposed to apply constant currents, and this was my mode of procedure:

We made use of a Gaiffe battery consisting of a number of cells, with a galvanometer to indicate the presence and direction of the current; the conducting

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(a) Huchard, On cardiac and pulmonary anginas etc., see also Clinical Therapeutics, Am. Ed. art. *Neuralgia*.

Hubener, Deutsch Arch f. Klin. Med. x i. 5, Cordes, D. Arch. viii. Fluebuch, Deutsch Arch. 1873. Armangawd, Note on angina pectoris, Bordeaux 1877.

wires terminated in flexible tin plates covered with chamois skin and kept moist to prevent the destructive action of the currents on the integument. We employed descending currents, and placing the positive pole on the upper part of the limb, and the negative on the lower, we passed the current down the member, sometimes varying the application so as to electrize the shoulder and arm alone, sometimes the forearm, and renewing the treatment whenever the patient was threatened with a return of the pain. In this way we arrested the progress of the neuralgia, and whenever the patient had recourse to this means, he would succeed by half an hour's application of the electricity in aborting his attack of angina pectoris.

A curious circumstance to which the patient's attention was directed was the fact that when we localized the galvanic current about the shoulder, we stopped the brachial neuralgia in its ascending march by forming, as it were, a barrier which opposed the transference of the pain to the nerves of the thorax and heart. You can with entire safety make use of this agency in like cases and you will often see excellent results therefrom.

Besides these attacks of angina pectoris which are common to maladies of the aortic orifice, you will often observe painful points over the region of the aorta. These *points doulonreux*, according to Peter, are a demonstration of the neuritis which almost always accompanies enlargement of the aorta in these cases. You

will have to combat these pains, and you will accomplish this by revulsives, such as fly blisters frequently repeated, the cautery, or punctiform cauterizations. The latter means seems to me the best, being but little painful, and producing energetic revulsion without any annoying suppuration. You will of course make your cautery points with the Paquelin thermocautery, and you will make them as lightly as possible over the region of the heart and aorta.

Such are the different measures which the physicians may employ in the treatment of aortic affections accompanied or not with attacks of thoracic angina.

CARDIAC ASTHMA.

Thus far we have been occupied mainly with the treatment of disorders resulting from the cerebral anæmia and from the attacks of pain which so often accompany aortic insufficiency. To complete this subject, I must now say a few words concerning the therapeutic means which you should employ to combat the paroxysmal dyspnœa (true cardiac asthma), so often associated with aortic affections. Here bromide of potassium will render you good service; it is as I have told you a heart tonic, acts on the bulbus and diminishes its irritability, and thus effectively opposes the painful dyspnœa. I have already indicated the mode of administration of this medicament. You may advantageously combine the bromide with hemlock, using the alkaloid cicutine.

Cicutine (conine or conicine) is, as you are aware, the alkaloid of the conium maculatum. Despite the numerous researches which have been made respecting this chemical principle, we have not as yet a complete knowledge as to its physiological action, and this is due, not to the inexpertnesss of the experimenters, but to the impurities which this alkaloid presents. It is only, in fact, since the labors of Mourrut have resulted in supplying the profession with a stable combination of this alkaloid, the bromhydrate of cicutine, that we have had in our possession a pure and crystallizable salt of cicutine.

It is only a short time since the alkaloid of hemlock was classed, from the point of view of its toxic action along with those strange methyl combinations (methyl-brucine, methyl-morphium) which have been studied by Brown and Fraser, and which constitute a class of poisons having properties identical with those of curare. According to the latest researches of Bochefontaine and Tiryakian, it is not to cicutine, but to a resinoid matter which the latter contains when impure, that this paralyzing action on the vaso-motors is due. Cicutine in its pure state has a special elective action on the bulbar respiratory centre.

I cannot too much insist on the above fact; you see from this why it is that cicutine has never as yet found its right place in therapeutics; and you also understand the reason of the contradictory results obtained by clinicians and physiologists. You have,

moreover, an illustration of the difficulties of experimental therapeutics, resulting not merely from the experimental method itself, but from the relative purity or impurity, and greater or less stability, of the chemical substance employed.

If you will then take pains to obtain cicutine in a state of purity, you need not be afraid of the toxic effects once attributed to this alkaloid, and you may give it in ten centigram doses in solution with a full dose of bromide of potassium. Hypodermic injections of this alkaloid have also been counselled; I should be inclined to be shy of them, and would not in any event advise you to use more than one or two centigrams of the bromhydrate subcutaneously. The principal thing to remember in prescribing this alkaloid, whether in the form of hydrochlorate or bromhydrate, is that your salt shall be free from impurity.[3]

But if cicutine has hardly as yet won a place in therapeutics, as the results which have been obtained from it in cardiac dyspnœa and angina have not been constant, the same cannot be said of iodide of potassium, which is one of the most reliable remedies to combat the asthma of heart affections, as well as the atheromatous changes of the aorta, and in the chapter on aneurisms of the aorta I shall return to this subject, and show the benefits of the iodide medication.

Chloral and chloroform have been recommended. Vergely, of Bordeaux, has even reported cases where inhalations of chloroform have alleviated attacks of

thoracic angina. (a) I should be very chary of the use of these two medicinal agents in aortic affections, for experience has shown that they are paralyzers of the heart.

So then, to sum up, you have these three principal remedial means with which to combat aortic affections and the painful symptoms often therefrom resulting: morphine,* trinitrine, and iodide of potassium; to which you may add revulsion, and sometimes electricity.

Such are the instructions which I deemed it necessary to give you as aids in the therapeutic management of affections of the heart, whether of the mitral or aortic orifices. To complete this subject, it remains for me to speak of the treatment of acute affections of the heart and its membranes. Endocarditis and pericarditis require an active treatment, which con-

(a) Vergely of Bordéaux, "On the employment of chloroform in cardiac affections." (*Union Med.*, 3 Seres. t. xxx, 1880.

* Picard and Reathel have made some interesting experiments as to the action of morphine on the heart. In the dog, after an injection of muriate of morphia, they have constantly noted a considerable fall in the average blood-pressure, and a corresponding slowing in the pulsations of the heart. They find reason to think that morphine acts on the heart itself, through its intrinsic nervous ganglia, thereby enfeebling the action of that organ. If, in fact, after cutting the two vagi nerves in a dog, you make an injection of morphine, the heart notwithstanding the section of its vagi, becomes slowed in its pulsations.

sists almost entirely in the application of revulsives to the cardiac region. There is then, as you see, but little to say concerning these acute maladies in comparison with those diseases of long duration which demand of the physician a varied treatment, to be modified according to the circumstances and complications which supervene.

The diseases of the heart are of very common occurrence, and from the very beginning of your practice you will be called upon to prescribe for these affections; you may be obliged to follow the course of these diseases for long years; you should then be well informed as to their pathology, symptoms and treatment, and be ready to meet the emergencies which arise; and it is for this reason that I have thought that it would be for your good to dwell almost exclusively on the chronic ailments, that is to say on mitral and aortic lesions.

In another chapter and another series I shall take up the treatment of aneurisms of the aorta, which, though rarer than the other diseases mentioned, are nevertheless worthy of your serious study and attention.

NOTES TO CHAPTER VI.

I. NITRITE OF AMYL.

According to Richardson, nitrite of amyl is a stimulant of the heart, and the dilatation of the vessels is due to over activity of the heart muscle. According to Bernheim and Filahne, the dilatation of the vessels and diminution of arterial

tension are of central origin, and depend on a lessening of the vascular tone; others, as Engelmann, think that this phenomenon is due to an inhibiting reflex action exercised on the spinal vaso-motor centres. Brunton, Pick, and other observers, affirm that amyl-nitrite acts directly on the smooth fibres of the vessels, as on the contractile fibres in general, paralyzing them.

Amez-Droz, Berger, Schram, Mayer and Freidrich attribute to the vascular dilatation a peripheral origin, while Huizinga, from his experiments on the interdigital membrane of frogs, explains it by a diminution of the tonic action of the nerve cells in the walls of the blood-vessels; others suppose an irritation of the vaso-dilator fibres by blood charged with carbonic acid, and others still to exhaustion following a too vehement muscular stimulation; whence paralysis and dilatation.

Still another view is held, namely, that nitrite of amyl produces its effects by an influence on the special nerve centres and anatomical elements of the walls of the blood vessels, and also by modifications which the blood sustains from an accumulation of CO^2.

2. CLINICAL EXPERIMENTS.

Lauder Brunton made his first trial on a young man aged 26 years, suffering from aortic insufficiency with left ventricular hypertrophy. The attacks came on every night, and lasted an hour. After having, without success, tried digitalis, aconite, lobelia, brandy, stimulants, cupping, etc., Brunton resorted to nitrite of amyl, as likely to reduce vascular tension. Five or six drops were poured on a handkerchief, and after an inhalation of from 40 to 60 seconds, the pains disappeared. These inhalations were renewed constantly with success, and it was remarked that the paroxysm of the night following was generally suppressed. Brunton says that he has

in every instance seen the patient get well after the usage of an ounce of nitrite of amyl. In cases of aneurism where the pain is continuous it does not yield to the medicament.

Other practitioners have employed the nitrite of amyl with success. Dr. Madden, who was subject to mitral insufficiency and angina pectoris, was markedly benefited by inhalations of five drops of the nitrite.

In 1873 Amez-Droz published in the Archives of Physiology a very interesting case of angina pectoris, much ameliorated by the nitrate. Bourneville and other observers have reported similar cases.

Kurz of Florence, who is an enthusiastic advocate of nitrite of amyl in the syncopal accidents of diseases of the heart, sums up the principal indications for the employment of this remedy as follows:

1. In organic affections with marked enfeeblement of the heart. 2. In the prostration consecutive to choleriform diarrhœas. 3. In the hydrocephalus of infants. 4. In tetanic or eclamptic paroxysms. 5. In attacks of asthma. 6. In malarial chills.

Begin with two or three drops and go on to ten, and stop when symptoms of congestion show themselves. Contra-indications: 1. Cerebral hyperæmia. 2. Atheroma (by reason of danger of apoplexy). 3. Plethora, with hemorrhagic tendency.

3. CICUTINE.—MODES OF ADMINISTRATION.

The hypodermic method is the best methed as the alkaloid is less efficient when given by mouth; the intestinal juices seem to have a destructive action on its physiological and toxic properties, as the gastric juice has on curare. This has been proved by experiments on animals; in the case of a cat weighing 3 kilos. 20 centigrams, taken by mouth, caused paralysis lasting four hours, while half that quantity injected under the skin caused a more intense paralysis, lasting sixteen hours.

The following formula is a useful one for subcutaneous injections:

Take of Crystallized bromhydrate of cicutine, 0.50.
Alcohol, 1.50.
Cherry laurel water, 23.00.

M.

One gramme contains 2 centigrams of the crystallized salt; one drop contains one milligram.

When given by mouth, the granules of the pharmacists may be used, the syrup or the solution. The GRANULES are made as follows:

Take of Crystallized bromhydrate of cicutine, 2 grammes.
Sugar of milk,
Syrup of acacia, ää q. s. to make 1.000 gms.

M.

Each granule contains two miligrams of the salt, or one milligram of the alkaloid.

SYRUP OF BROMHYDRATE OF CICUTINE.

Take of Bromhydrate of cicutine, 1 part.
Simple syrup, 900 parts.

M.

Every 10 grammes contains 1 centigram of the salt, or 6 milligrams of pure cicutine.

SOLUTION OF BROMHYDRATE OF CICUTINE.

Take of Pure bromhydrate of cicutine, 0.30.
Peppermint water, 50.00.
Distilled water, 250.00.

M.

A tablespoonful contains 1 centigram of bromhydrate of cicutine.

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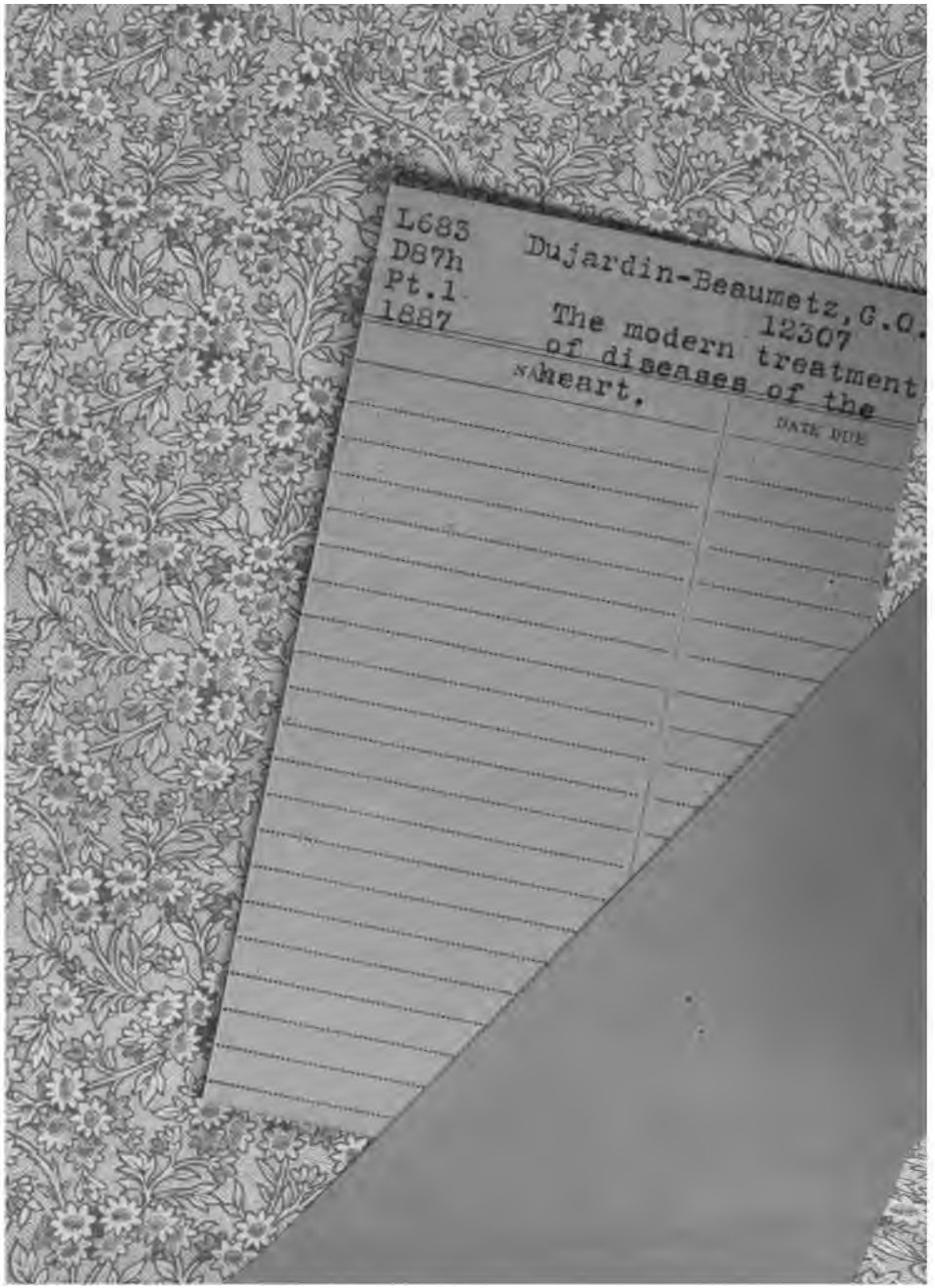
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